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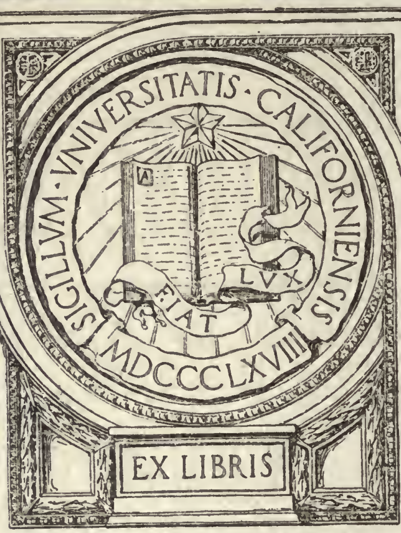

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THE A. VANDER NAILLEN

School of Practical Engineering

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51ST STREET AND TELEGRAPH AVENUE

OAKLAND, CALIFORNIA

ESTABLISHED 1864

C. LEIDECKER FRUITVALE

ATTAINMENTS REQUIRED FOR ADMISSION

THE mathematical attainments required for admission to the courses of our school are simply the first four rules of arithmetic, viz., addition, subtraction, multiplication and division. An understanding of these bases of all mathematical science is sufficient for a student to make a good beginning. It need not be said, however, that a knowledge of the higher mathematics will be greatly beneficial. The principal qualification necessary, however is a little good common sense, whether you know anything about mathematics or not.

THE A. VANDER NAILLEN

School of Practical Engineering

INCORPORATED

ESTABLISHED 1864

A. VANDER NAILLEN, President
A. VANDER NAILLEN, JR., Gen'l Manager

Open
All Year

No Classes

Individual
Instruction
Only

CIVIL
MINING
ELECTRICAL
STRUCTURAL
HYDRAULIC AND
MECHANICAL
ENGINEERING
SURVEYING
ARCHITECTURE
DRAWING
ASSAYING
CYANIDING AND
METALLURGY

Practical
Laboratories
and
Work
Shops

STUDENTS
CAN
ENTER
AT
ANY
TIME

TELEGRAPH AVENUE AND
51st STREET

OAKLAND, CALIFORNIA

AVERAGE
LENGTH
OF
COURSE
TWELVE
MONTHS

A15A3

PROF. A. VANDER NAILLEN, C. E., M. E.
Author, Scientist and Educator
Chevalier of the Order of Leopold of Belgium.
Founder of this School in 1864.

CALIFORNIA

A. VANDER NAILLEN, JR., C. E.
Manager
Mining Engineer and Assayer; U. S. Dep. Mineral Surveyor; Licensed State Surveyor
Ex-U. S. Dept. Gov. Surveyor; Ex-Com. Board of Public Works, S. F.

OVER forty-four years ago we were actively engaged in the construction of some of the most important railroads in the east, when the fact was forced upon us that the young engineers we took as assistants showed very little practical knowledge of the details of the work intrusted to their care. Almost every day walls had to be torn down, roofs altered and culverts relaid, owing to an undue preponderance given to the theoretical teaching in the engineering schools. One of the most prominent and perhaps the oldest chief engineer in this country, used to say: "My assistants would calculate me out of hearth and home, but I can not trust a single one of them with the driving of a pile or to put the foundation under a culvert."

To remedy this evil in a certain measure, and at the instance of several chief engineers, I concluded to open a school where practical engineering should be taught, and the principles of construction shown in their simplicity, disembarrassed of all the technical bulwarks put around them by an old-school fogyism.

We started our school in Pittsburg, Penn., in 1864, and afterwards, at the instance of some of the most prominent citizens of Chicago, we removed to that city.

Our school grew more and more prosperous, and in 1871 we had certainly the most efficient and best equipped polytechnical school of the west, when the disastrous fire which destroyed almost the entire city of Chicago reduced our school to ashes. The nervous shock said conflagration caused on some of our beloved ones decided us to remove to California, where we have been established since 1874. Our school has proved successful beyond expectation, as the actual positions occupied by our graduates indubitably show. Many of them are chief engineers to-day, and we do not know of a single student among the several thousands that graduated with us who does not do honor to his *alma mater*.

Our school, thus bringing the profession of the engineer within the reach of any good, common intelligence, could not fail but meet with a good deal of opposition from interested sources, and so it did. But some years ago one of the most prominent civil engineers in this country, an author of several of the best engineering publications in existence, John C. Trautwine, took a decided stand on our side, and boldly printed in the preface of his "Engineers' Pocket-book" the following statement: —

"Nearly all the scientific principles which constitute the foundation of civil engineering are susceptible of complete and satisfactory explanation to any person who really possesses *only so much elementary knowledge of arithmetic and natural philosophy as is supposed to be taught to boys of twelve or fourteen in our public schools.*" He goes even further, for, after a lifetime of observation, Trautwine states in the same preface: "*Comparatively few engineers are good mathematicians, and in the writer's opinion it is fortunate that such is the case, for nature rarely combines high mathematical talent with that practical tact and observation of outward things so essential to a successful engineer.*"

When we wrote the above, its meaning was intended for our country only. Our astonishment may easily be surmised when, during our visit to the Paris Exposition, we read the following statements expressed in the *Revue Industrielle des Mines et de la Metallurgie*, of Liege, a most noted engineering magazine. The title of the editorial reads, "THE EDUCATION OF ENGINEERS." W. Paul von Lossow, engineer and professor at Munich, says: "*When engineers get to occupy positions where real engineering services are required, they soon realize, without exception how unsufficient their schooling has been in the practical part of their profession, and it is not without many difficulties and anxieties that they are at last able to overcome this lack of practical education. The theoretical professors of our universities,*" says Professor von Lossow, "*are unable to instil into the soul of their students the love of a profession which they have not themselves exercised. To form competent engineers, the professor must be an engineer himself, for it is only when the students feel that their professor has gone himself through the many trials which await them, and which he points out to them, that they will have full confidence in him and his teachings.*

"*Mathematics are for the engineer but a scientific tool, and it is wrong to award an exaggerated importance upon any tool,*" states Professor von Lossow with much earnestness.

Furthermore, when in Paris, the head of one of the most noted French technical schools called on us, and desired to know in all its details the methods we follow to render our school so practical, which means how we have brought it to its present high state of usefulness. "For," said he, "we must make our schools of France more practical, if we would have them more efficient."

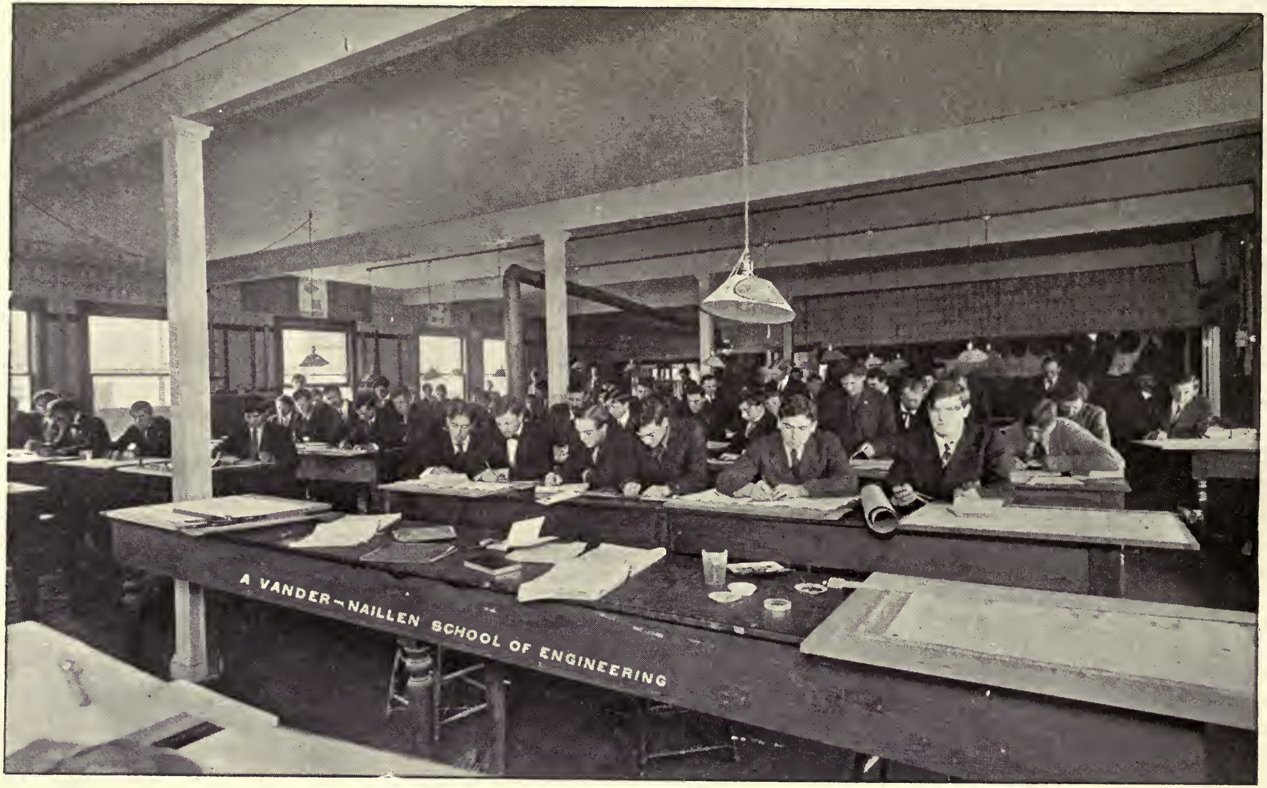
And these experiences prove to us that we have always been right in our aims, when endeavoring to make our school more and more practical, and also when we were steadily expelling from our course that order of barren mathematics which has no practical bearing upon the work the engineer will have to perform.

TO PARENTS.

When parents commence to think about the future of their fast-growing boys, it is always a matter of anxiety to know in what profession they would be most likely to succeed. This is certainly a matter of great importance to parents and to their children. In selecting a profession for a boy, after consulting, of course, his natural bent and disposition, a parent should always select one that is likely to give more than a mere competency—one that liberally rewards the experience daily acquired. Such are the professions of civil, electrical, mining, or mechanical engineer, surveyor, or architect. We all know that engineering is a very honorable profession, and held in high esteem by everybody. The capitalist respects the engineer, because capital relies on him to increase and multiply. The engineer discovers the treasures of the Comstock. The engineer builds the enormous steamers crossing the ocean. The engineer constructs the Pacific railroads, permitting the east and west to shake hands. The engineer builds the Mt. Cennis tunnel, the Suez Canal, the Panama Canal, lays the Atlantic Cable, irrigates our arid plains, drains our drowned tules; in one word, the engineer is the sill, the basis of all material progress and prosperity in this sublunary sphere of ours. No wonder, then, that whenever a corps of engineers appears, with their mysterious instruments glittering in the rays of the shining sun, the inhabitants flock around them, welcome them to their homes, and eagerly proffer hospitality, for well they know that wherever an engineer corps appears material prosperity is sure to follow in its track. Young men should carefully ponder over all the advantages of these professions, and impress upon themselves the idea that in our school they are easily acquired though thoroughly imparted.

DUTY OF PARENTS TO DEVELOP THE LATENT POSSIBILITIES OF THEIR CHILDREN.

Every young man shows a special aptitude in some branch or other in the public school. It is the duty of parents to watch and to catch these indications ; they are the finger of the Almighty pointing in his mysterious way to the road that the child should follow. Parents, we say, heed these indications by all means and thus help your children to pursue the path laid out for them by the ruler of destinies. A few dollars should never deter you from giving a fair chance to your sons—



ONE OF OUR DRAUGHTING ROOMS

from letting them try with all their might—to climb higher in life and thereby to benefit not only themselves, but also yourself, and often the entire race. We believe that every human being has been called upon to perform a certain role in the great scheme of creation, and controlling circumstances only prevent many from shining with a light as bright as it was intended they should, if conditions had been more congenial and favorable. It is the absolute duty of parents and guardians to surround the young and tender intellects that are growing up around them with all the conditions necessary to develop a soul-growth, and as a preliminary step to watch indications of aptitude. Here a boy shows a special talent for drawing; his school-books are covered all over with pictures. Watch that indication; some of the greatest artists and engineers of the world have commenced just that way. There a scholar shows a marked ability and liking for calculations; he is at he head of his class at the public school, and his teacher is astonished at the progress of his young pupil. Parents, watch this indication carefully. It shows a trained and correct reasoning mind, and may culminate in a great engineer or man of science. Another boy is dull; seems a good-for-nothing dreamer; he neglects his petty duties: hardly listens to what is told him; in fact, you find him always musing and thinking of something else. This boy must be especially watched. Many great men and profound thinkers have commenced life the same way. A chance for study should by all means be given him. Parents, take heed of what is said above. An institution like ours will surely awaken, quicken and bring vividly to light any latent talent or possibility whatever lying dormant within your son. It has always been a supreme pleasure to us to take hold of the young and often neglected intellects, to give shape to them, to mold them to some attractive and remunerative profession, and to place them on the road leading to *honor, wealth and fame.*

HOW SOME WIDE-AWAKE ENGINEERS MAKE LARGE FORTUNES.

Whenever an engineer runs a preliminary line for a steam or electric railroad, canal, etc., he is certainly the first to know where that railroad or canal is to be built; he knows also by experience, that wherever such railroad crosses a navigable stream running through a fertile valley, a city must spring up, where freight houses and depots will be erected, because the river will be the main artery to bring the products of the valley to the railroad for shipment to market. Here the engineer has the first chance to enter or purchase the lands destined by force of circumstances to become the site of a city in the near future. The lands are often purchased for a small sum per acre, and sold for $500 per acre a few years afterwards.

The capital to make these purchases is often derived from accumulated salaries alone. The engineer corps in the field have their tents, cooking apparatus, food, etc., furnished by the company, so that a careful member need incur but slight expense, and can always accumulate money enough to take advantage of any chance for investment that comes in his way Many of our engineers have acquired large fortunes in this manner.

BOYS AND MEN, EDUCATE YOURSELVES.

The only road open to you leading to success in life, in business, in monetary matters, is the solid, practical education which a good school affords, and the higher education which it teaches you. If you would attain true manhood you must know your duties toward your fellow-beings and the import of human life. Education alone will give you that knowledge. Science will open to you the secrets of the world and make you understand the laws by which you are surrounded. Boys and men, educate yourselves by all means; for we repeat, through the medium of a practical education alone can we approach nearer to the type of true manhood.

The early education of many young men has been neglected, some through lack of opportunity to attend school in youth, others for not having taken hold of that opportunity.

To that class we offer the best chances for education, *no matter how far back in their studies they may be.* They must never be deterred from attending such a school as ours, for we give in a practical, short way, and in a comparatively short time, all the requirements necessary to be able to follow our courses thoroughly. To the wild boys, we say, " Come." Your exuberance of vitality, your restlessness of spirit, so inconsistent with a sedentary profession, will find a congenial field of action in the construction department of engineering, or in United States surveying, mining or in the electrical field so interesting. Your activity and constant supervision will keep your help steadily at work, and you will get more labor out of the graders than great mathematicians would.

We repeat, do not be afraid to enter our school of engineering because you possess little knowledge of mathematics, or any other branch of education. Our methods of tuition are so simple, so practical, that a short preliminary preparation soon enables any young man to follow our courses. Many young men who have proven the truth of this assertion, are splendid engineers to-day, and did not really know how to make a multiplication of decimals when entering our school. A good dose of practical COMMON SENSE is what we want. That alone is the staple for successful engineers, surveyors, machinists, electricians, etc. All other branches are accessory, and we guarantee to give them in a short time to any one who will apply himself diligently.

OUR METHOD OF TEACHING.

Our instruction is entirely individual. We have no classes, as we have found by long experience, that teaching large classes must result in many students lagging behind, not because they are less intelligent, but simply for the reason their minds do not grasp things at a jump. We find it absolutely necessary to follow every student in his daily progress, so we may be assured that he fully understands every lesson taught him, and thus be able to finish creditably, the course of instruction he has chosen, in the comparatively short term allotted for its completion. Each student is accorded the privilege of asking instructions at any time during the day. Thus not loosing a moments time.

INSTRUCTION TO MEN OF MIDDLE AGE.

An unexpected and very encouraging situation has developed itself in our institution since we have been established in California. Many men of middle age, from 45 to 65 years, have come to us for some special instruction in the career they were practically following. This is especially true of miners. They generally take up the assaying course and the special course in mine surveying. We will always cheerfully remember the earnestness of an old gray-haired miner when studying assaying. He stated that he had made many men rich and that now *he was going to try to get rich himself by keeping his eyes open and knowing what he was about.*

Hence, we find that an institution like ours fills a need very much felt, as it offers a chance for study to men of good brain power acquired through practical pursuits and often hard work in the engineering field: be it in the mines, electricity, surveying, or in any kind of mechanical lines, many of whom have become foremen, superintendents, etc., etc., through personal merits alone. Their early education has in most cases been neglected, often through the necessity of early work for wages.

Many of these young or middle aged men lack merely some technical rules, principles, and calculations, to make them *supremely proficient in their professions.* These practical men have acquired through hard work and study, that same experience which the University graduates must begin to learn upon entering the practical duties of their chosen career. Do not let it be surmised for an instant however, that we do not fully appreciate the theoretical education vouchsafed by our Universities.

CALAMITY FIELD CLASS

Immediately after the calamity of April, '06 most of the above students were provided for by ourselves, a few days later they were taken to the mountains for actual field work, hence having lost no time. The lower picture reads JUST LANDED. The upper one, READY FOR WORK.

These same practical men, when once they have made up their mind to enter school and thus become well prepared to enter a higher and more remunerative field of usefulness, are exceptionally earnest in their studies. Experience has demonstrated to them the absolute importance of the theories underlying all practical work in the engineering fields. We know that we must and we do adapt our teaching to the educational attainments of these men, be they advanced or merely rudimentary. All the complicated formulae of the higher mathematics, supposed to be necessary to unfold certain theories, must be brought down to *simple arithmetic*. This is what our institution has so successfully accomplished during its nearly half century of its existence. The fruit of its labor is exemplified in the numberless eminent engineers who graduated from it, now occupying important and very remunerative positions all over the United States.

HEED THE "STILL SMALL VOICE."

Many mechanics, miners, farmers, etc., are restless in their trade or at their daily routine of work. They feel that their brains are capable of something better and higher than what they are doing. Heed this little voice! Friends, it is a duty we owe to ourselves to give it a hearing. It is the prompting of the spirit within us calling us to a higher field of action, into a more elevated, more useful, plane of existence. Many mechanics have heeded this "small voice" and have come to our school, where studies are made so practical, and have been simplified. Many of them are chief engineers of railroads to-day; others are successful architects, superintendents of rolling mills and machine shops, making a great amount of money, and enjoying a consciousness of being great and useful men. Give us a trial, and we warrant to find out the true path of your usefulness, in which we will help you with all our might.

THE ETHICS OF THE ENGINEERS.

When students enter our school we make it a point to impress upon their mind the importance of the step they have taken. We tell them that we are not schoolmasters, holding a stiff rod of discipline over their head, but that we rely entirely upon their full appreciation of the honorable career they have now entered, for their good behavior.

We consider our students cadet engineers, and as such we tell them to be proud as we engineers are somewhat clannish, because we think we are a little better than other people for the reason that we know a little more than other people, hence we tell them to be careful about their daily associates, not to run with Tom, Dick and Harry, and to remember that as soon as they graduate from our school their lines of work will lie with the capitalist in whose companionship they will constantly be thrust. The engineer must behave in such a gentlemanly way that the capitalist will find a constant pleasure in his company. Then the career of the young engineer will run smooth and prove very remunerative indeed. It is the engineer who is responsible for the vast sums of money invested by the capitalist.

DETAIL OF THE COURSES TAUGHT IN OUR SCHOOL.

SURVEYING

Comprises preliminary calculations, mensuration, logarithms, plane trigonometry, with all its application to surveying; also, practical demonstrations in the field with transit instrument, and surveying by bearings and distances of boundaries, and number of acres calculated by tabulated latitudes and departures; omissions in bearings and distances of courses supplied by trigonomical and other calculations; extensive field practice with both compass and transit instruments; and thorough instructions given in the new and indispensable method of double centering rendered so necessary by the loose method employed in many of the United States land surveys. We teach United States public land surveying complete — principal meridian, base line, standard parallels, township lines, sectionizing, and give thorough field practice with solar compass after the student has acquired the method of finding astronomical and Greenwich dates, the sun's declination, the latitude of place, and correcting errors arising from refraction. When he has acquired a thorough knowledge of the method employed by the United States in the surveys of the public lands, the student is given a full course of county surveying. This is of great importance in enabling him to subdivide sections according to law and to the decisions given by the superior courts. As we have stated before, the survey of public lands on the Pacific Coast has, in many cases, been made in a loose manner, the official notes kept in the surveyor-general's office not agreeing with the lines as found in the field by the county surveyor. This state of things is often complicated by the disappearance of witness trees and other land marks, all of which make a complete course in county surveying absolutely necessary, if the surveyor would establish lines upon which the farmer can build his costly fences with the assurance that they will never have to be removed by conflicting surveys.

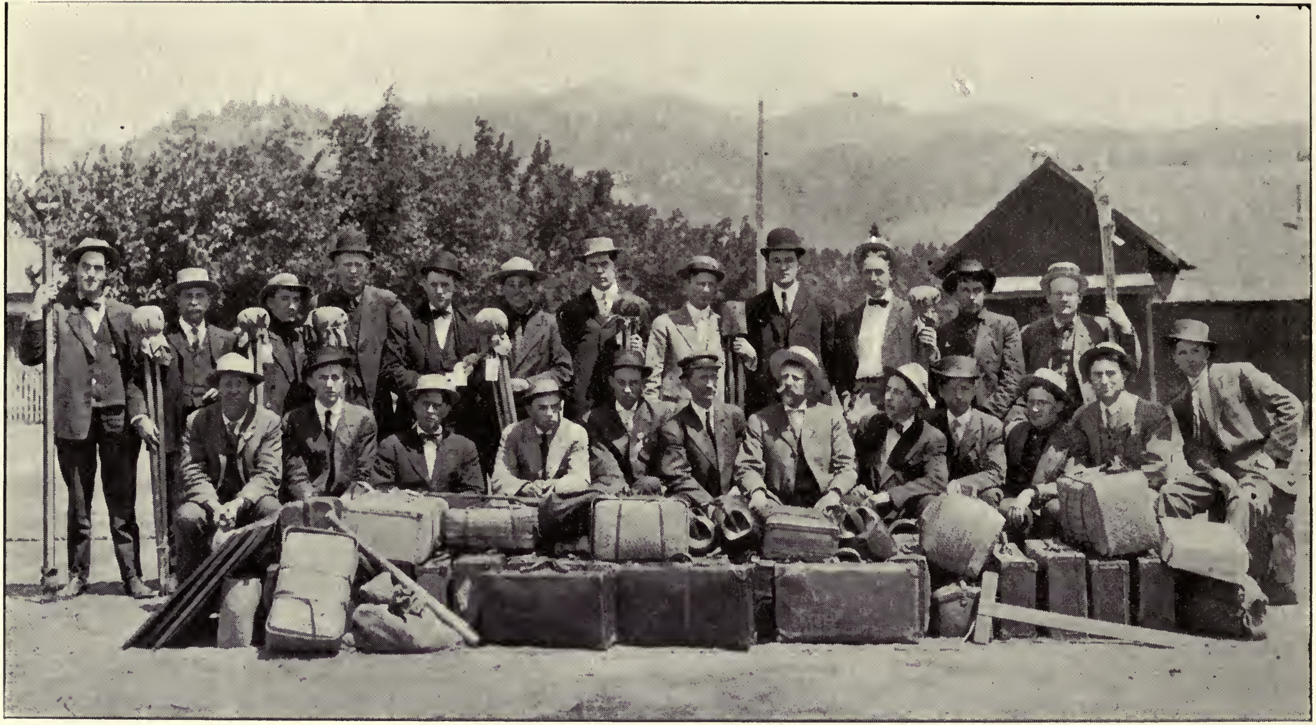
After the student has been thoroughly trained in county surveying, and is therefore enabled to establish beyond a doubt the correct courses for any subdividing of a section, he is instructed in the important branch of city surveying, or subdividing acre property into town lots. His attention is called to the importance of establishing correct monuments on the boundary of his subdivision, to the best methods of laying out streets, and to the mode of locating lots so as to make them readily salable, and also as to the necessity of taking correct measurements, with a view to prevent future litigation. These subdivisions are platted with great care, and neatly executed and colored, so as to be an ornament to the recorder's office. The best method of obtaining the true meridian at any place are carefully taught to the student, giving him the necessary astronomical knowledge; and the magnetic variation, which is to guide him in all his surveys, is carefully established.

The best and clearest method for describing land is carefully taught in our school, so that the student may be enabled to make out deeds clear in description, leaving no room for the least shadow of doubt. A personal lifelong practice in the field has convinced us that many of the lawsuits about land pending in the courts originate in obscure descriptions in the deeds.

Dividing land is also a branch requiring great attention of the student. We claim the graduates of our school can divide correctly any piece of land, or Spanish grant, however broken its outline or numerous its courses or meanders may be, or in whatever shape it chances to be situated.

The problems and methods of coast and geodetic surveying are also carefully taught to our students, and many of our graduates have found pleasant and emunerative employment in both these branches of the United States service. The students in surveying receive a thorough course in topographical drawing, India ink, and sepia coloring of mountains, and highly finished and colored real estate maps, including correct scale platting of whatever kind, enlarging or reducing scale of maps, etc., etc. The course of surveying includes also a course of constructive drawing, bills of material, estimates for cost of trestle-work of various kinds, bridges of small span, including "A" truss, straining beam and Howe truss, whose building is likely to be done by the county under the immediate supervision of the county surveyor. A series of test surveys is required from the student before he graduates, and his field work terminates with camping in some spot where real government landmarks can be found, with the original witness tree standing, from which he is required to establish the true corners and retrace the lines of the original and official survey. This course does not include railroad or level work.

The time required by a diligent student to complete the above course is about six months.



44th ANNUAL FIELD CLASS OF CIVIL, MINING AND ELECTRICAL STUDENTS WAITING FOR STAGE TO PALISADE MINES.

CIVIL ENGINEERING.

When a student has completed the course of surveying as above described, he enters, if he so desires, the course of Civil Engineering; strength, weight, and cost of material are the first calculations that meet him, after which, having his trigonometry as yet fresh in mind, we have found proper to begin with the study of railway curves. We take great pains to give our students a complete course of curves, including simple, compound, reversed and taper or transition curves, containing in detail every instruction necessary to the young engineer, so he may be enabled to solve every problem and overcome any difficulty he may meet. The taper curves, successfully introduced of late years for mountain lines, receive a good share of the student's attention. The theory of curves once well understood, the student is given a course in the field, where he stakes out these curves, ever changing his instrument to different stations so he may be enabled to overcome any obstacle like bluffs, hills, trees, etc., which he may find in his line of sight.

Once proficient in railway and other curves, the student receives instruction in simple and compound leveling—establishment of datum plane, bench marks, and is shown how to make proof of the correctness of his field notes. Extensive field practice is given to the student and he is instructed in the method of running check levels intended to prove either the error or correctness of the work. Platting on profile paper the elevations obtained from the level notes is next in the course, after which careful instruction is given in the establishment of the grade lines for railroads, highways, canals, motor lines, etc. From this profile, upon which the grade line is now drawn, the center cuts and center fill are calculated and recorded on the general note-book for construction, and the culverts, trestle-works and bridges of every kind as to height and span, determined. The student is then instructed in the theory and practise of setting slope stakes, and the principles of regulating the ratio of the slope, according to the nature of the soil traversed. When the slope stakes have been correctly set and the center depths ascertained, the student is ready for a very important branch of engineering, and that is for the calculation of earth work. To ascertain accurately the cubic contents of any kind of earth or rock work, excavation in tunnels, the number of cubic yards in large gravel hills or beds, burrow pits, or when cutting down to various street grades city blocks with rolling surface, is absolutely necessary to the engineer, and we teach this branch of our profession by different methods, the main one being mean areas, prismoidal formulae, and the use of several standard tables as a check. We carefully demonstrate to the scholar the special result of each system, some being in favor of the contractor, and others benefiting the company. After this the method giving a perfectly correct result is explained, so that our graduates may always obtain a decision in favor of their own work and estimates, in case a disagreement between engineers should be taken before the superior court.

The use of the stadia, clinometer, and other instruments is now shown to the student, to enable him to take the angle of inclination of all slopes of the ground traversed by this line, and plat the contour lines for any zone by inspection, according to the degree of accuracy required by the work.

At this stage of advancement the student is made to plat a preliminary line of railway or ditch, from perfect field-notes taken by us, with the topography of the country traversed, locating exactly the obstacles encountered, which have made necessary the various deflections in the line, etc. This part completed, the student is now ready for actual field-work. He is instructed to choose the road with easiest grades, minimum of cuts, and run a preliminary line, make preliminary estimates of the cost of the whole line, including earth-works, cattle-guards, drains, etc., culverts of timber or stone, trestle-works, bridges, and all the constructions the road may require. He is shown how to "tie" or determine by reference stakes the initial point of the line, and then runs the transit, meanwhile keeping correct field-notes in proper shape, and direct the chainmen, the stake artist, etc. The line once staked out, the student proceeds with the leveling instrument to take the levels of the line, by the means of which he obtains a perfect profile. He then takes charge of the topographical party, whose notes enable him to establish the contours of the preliminary line affording a good representation of the country through which the line runs.

The field work once performed, and all the plans, profiles, and estimates of cost of earth and stone work, tunnels, and various superstructures completed, the student proceeds to the corps of instructors assembled to hear his report, and before them, as before a board of railway directors, he explains his work at length. The line is critically examined, its direction and grade changed in several places according to the various requirements of the transportation and maintenance-of-way departments, safety of travel, speed required by main through lines, economy of steam, and the final location to commence at once. The student proceeds to the ~~and the final location to commence ta once. The student proceeds to the~~ field immediately, commences the final location of the line, makes the alterations ordered by the board of directors. He now runs in the curves, simple reversed, and compound, and where the necessity for these is felt, a series of taper or transition curves. This done, he proceeds to cross-sectioning, or setting the slope stakes by various methods and to diverse slopes, according to the nature of the soil. He runs check-levels on the bench-mark, and places new ones at the crossing of streams, or at whatever points constructions have to be erected, such as trestle-works, bridges, culverts, etc., and from these benches he is shown how to direct the pile driver to saw off the piles for the abutments, piers, etc., at the proper length to accord with the accepted grade of the road.

The student is now instructed to draw up forms of contract and specifications for all kinds of work, and is thoroughly posted about the precautions to be taken in order to bind the contractor to perform perfect work and also to avoid litigation resulting from dubious wording and consequent misunderstanding. Next comes instruction in maintenance of way, ballasting, draining, and laying of track, frogs, road-crossings, switches, etc. All engineering construction, with all their details, are thoroughly taught in our school, and skew stone arches or bridges with the inherent stone cutting, straining sheets for iron and composition bridges, and their construction therefrom, city water works, sewage, irrigation, reclamation of salt water and tule lands, mining ditches, etc. The necessary hydraulics are also taught in our school, as are the different methods of ascertaining the heights of mountains by aneroid barometer. Graphics for strain on bridges is taught next.

A course of railroad architecture is also given, comprising engine-houses, wooden, brick, and stone; turn-tables, in-freight, and out-freight houses, machine shops, blacksmith shops, paint shops, station houses with and without residence of agent, general offices, railroad eating-houses and hotels, etc., roofs of large span, etc. Time, twelve to eighteen months.

MINING ENGINEERING

Includes the greatest part of the instruction given under the head of surveying. The instructor in this department being also a practical United States deputy mineral surveyor, having had years of experience, is therefore thoroughly qualified to impart to our students the thorough instructions as issued by the surveyor-general and the United States laws.

This course includes the practical experience of correctly locating mineral monuments and corners, which is so very important in the mining districts, also their restoration in case of total disappearance. This course includes all of surface and underground surveying.

Sketch of the formation of the earth's crust, with special reference to ore deposits.

Mode of prospecting, working, timbering, draining, ventilating mines.

Technical study and drawing of hoisting and pumping machinery.

Free-hand sketching in black or in colors.

Finished color maps of mining properties, showing all the underground workings as well as the structures aboveground with the topo-

FIELD CLASS OF STUDENTS IN SURVEYING IN CHARGE OF PRACTICAL ENGINEERS graphical features of the latter, mechanical draughting, strength of material, construction of trestles, flumes, bridges, etc.

Architecture necessary to erect mill constructions, boarding-houses, superintendent's residence, etc., with bills of material and estimates of cost.

This course takes about six to nine months' time to prepare for United States deputy mineral surveyor.

THE HIGHER MINING COURSE.

The instructions which now follow are related to the solutions of mathematical problems in regard to the location of outcroppings, shafts connecting tunnels, cross-cuts, adits, winzes, etc., enabling the student to make any underground connection, no matter how complicated, with accuracy and safety. This part of the course is of supreme importance, as much money might be wasted by the inaccuracy of the engineer, or human lives sacrificed, as, for instance, in tapping prematurely a shaft full of water. We pay special attention to the imparting of instruction on this point, giving several means to test the accuracy of this kind of work, and every problem is thoroughly and practically put into practice in the field with the mining instruments.

The mining engineer should be proficient in the science of hydraulics (see Elements of Hydraulics), as water problems confront him constantly, not only in placer mines, but in any other mine where water becomes the motive power or appears as an enemy. Then to master these difficulties we must consequently have the knowledge of the main elements of hydraulics needed by the mining engineer, and as a suppliment to this we give special instructions as to the most practical manner of bringing water to the mining plant in ditches on side hills, plan of square and V flumes, and appropriate trestle-work to sustain these, small bridges and other necessary constructions in wood, stone, or iron to that effect, with bills of material, estimates of cost of same, enabling the student to become the contractor, if he so desires, for the erection of all these structures, especially mill construction.

Description of the different processes of concentrating, amalgamating, and assaying of ores, also of the chlorination process of auriferous sulphurets and cyaniding; the leading processes for silver ore, and the methods of washing gold-bearing gravel by hand, are given in the assay course.

As stated before, sufficient instruction in architectural construction will be given in the mining course to enable our graduates to design and erect mills, dwellings, warehouses, barns, sheds, or any other construction needed in the plant, with bills of lumber, iron, stone, concrete, or any other material required, cost of same, he will thus be competent to superintend and direct the erection of all such constructions.

A thorough course of mechanical drawing is one of the most necessary adjuncts to the requirements of the mining engineer. Castings break almost every day, or new ones are needed, and accurate drawings of these sent to the foundry will give the satisfaction, on receipt of the castings, to see them fit exactly in their place and perform well the work expected from them.

To more fully show the importance of the above we give the following extract from a letter sent to us from the largest silver mine in the world:—

"*The party you send us must thoroughly understand MECHANICAL DRAWING, as we have a long distance to send to foundries and machine shops, therefore can not afford to have castings sent to us that would not fit.*"

A thorough course of gearing, shafting, pulleys, and belts, in fact, all mechanical movements and transmissions is indispensable. This will compel all parts of the mill to work in harmony as to speed, and not the stamps run too slow while the concentrators run crazy, as we have seen many times.

It is only by having a mastery over all he details of his profession that a mining engineer will erect and superintend successfully mining plants which will pay the owners honest returns by extracting the largest quantity possible of the precious metals from the ores in the most economical way. The entire course of mining requires from one year to eighteen months.

PRACTICAL MINE SURVEYING.

All practical mining engineers know that it is impossible to teach this branch of the profession thoroughly, without giving the students actual experience in a mine. This being so, we made it a part of the course many years ago, to take our students to the Palisade mines, which have been connected with this institution, and where they are given practical experience in the work of surface and underground surveying; tunnel and shaft connections, also the different formations, following the vein, showing by actual conditions in the mine, the pay streak, country rock, the walls, etc.

Ore is taken from the mine, the outcroppings, and from the different prospects by the student and is assayed by him in the assay office.

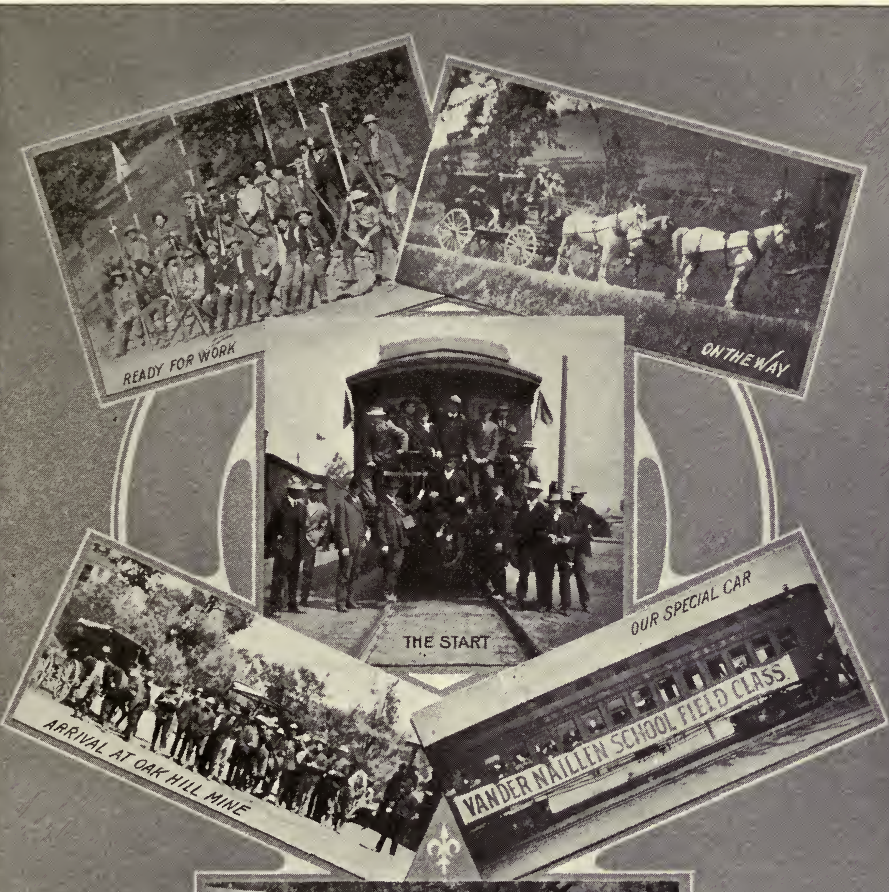
There is installed at the Palisade mines a 10 stamp mill costing $50,000, which includes an immense roaster, dryers, amalgam tanks, refining plant, rock crushers, boilers and engines, and in fact everything that constitutes a first-class mill, as shown in photos on the various pages of this prospectus. The student is taken through this plant, and the entire workings are explained to him in detail, after which he is shown how to make a sketch with complete and correct measurements of the entire construction so that a complete finished working drawing can be made from the same. The student is also shown how to measure the large tailings dump in order to calculate the number of tons the dump contains, and an assay is also made of the tailings to ascertain what percentage of the value in the ore has not been extracted in the mill.

The Palisade mines consist of many claims which are all patented, and necessarily have all been surveyed and staked out by official surveyors. The student is obliged to make a complete survey of all these claims and do the work just the same as if he were an official. In this work we often find the old monuments missing, which the student under the direction of his instructor, who is a U. S. official surveyor, must restore, not only mining claim monuments, but also U. S. government corners, which having been established perhaps some 50 years ago, have been destroyed by the elements or some other cause. The establishment of these corners is a very important matter as millions of dollars of litigation are caused yearly by incompetent surveyors who attempt to locate these corners and do it wrongly. We claim that this branch of surveying can not be learned without the student is taken to the very spot where these conditions exist, and is taught by an official surveyor, who has been through the mill.

ASSAYING AND METALLURGY DEPARTMENT.

AS ORGANIZED IN ORDER TO MEET THE EVER-INCREASING REQUIREMENTS OF METALLURGICAL SCIENCE.

The mining industry on the Pacific Coast, from South America up to Alaska, including California, Nevada, Oregon, and British Columbia, has taken recently an extraordinary development, and this is not only due to the discovery of new regions rich in gold and silver, but also to the advancement in the mining processes and progress made in the mode of extraction of the precious metals from their ores. Mines which were considered valueless a few years ago, owing to the very low grade of their ore, can now be worked at a profit by the application of the cyanide process and by the improved leaching and chlorination processes; and this progress


READY FOR WORK
ON THE WAY
THE START
OUR SPECIAL CAR
VANDER NAILLEN SCHOOL FIELD CLASS
ARRIVAL AT OAK HILL MINE
ARRIVAL AT GRIGBY'S

On the Way~

has been made possible by the advance of mineralogical and metallurgical science, increasing their ability to determine more correctly the intimate relations to one another and to the precious metals of the mineral constituents of the ores.

In view of all these new developments, we have reorganized our assay, chemical and metallurgical department, and subdivided it into several branches, in order to enable us to give to any miner, or to those desirous of following the mining career, precisely the kind of instruction which his purposes in the mining fields may require.

The COURSE OF ASSAYING is divided into seven parts, as follows:—

Course I.

Fire assay by crucible and scorifier for gold and silver, and crucible assay for lead.

Assay of copper by the Swedish method, which precipitates the copper in the metallic state.

Bullion assay for gold and silver by fire.

Course II.

Blow pipe assay for gold and silver.

Determination of the percentage of sulphurets in the ore.

Determination of the percentage of moisture in the pulverized ore.

Course III.

To be a competent mining man, it is absolutely necessary to know at least, those chemical elements and their combinations that are in close connection with mineralogy and metallurgy.

As generally the time of the students is limited, they cannot afford the long term necessary to a complete course of Inorganic chemistry and its analysis. Therefore we have inaugurated a course of *qualitative and quantitative determination* of the more important elements that are in connection with metallurgical chemistry.

Our aim has been, in organizing this course, to have it so simple and practical, that it may be easily acquired in a comparatively short time by students entirely unacquainted with elementary chemistry. This course is given practically by laboratory experiments only and is under the direction of a competent instructor having had twenty-five years experience in the mines of the entire Pacific Coast, from Alaska to Mexico.

By means of this system, the student acquires a practical knowledge of chemical properties, and gradually forming an idea of the theory of chemistry, becomes a mining chemist and a thorough assayer.

Synopsis of the Course.

1. Gold—by fire and by metalic precipitation.
2. Silver—by fire and by metalic precipitation.
3. Copper—by Volumetric and metalic precipitation.
4. Iron—by Volumetric method.
5. Mercury—by metalic precipitation.
6. Tin— by metalic precipitation.
7. Antimony—by metalic precipitation.
8. Lead—by fire and by precipitation.
9. Nickel—by precipitation process.
10. Zinc—by precipitation process.
11. Arsenic—by precipitation process.
12. Sulphur—by precipitation process.
13. Silica—by precipitation process.
14. Magnesia—by precipitation process.

The above course inlcudes courses I and II.

Course IV.

MILL TESTS.—The mill tests are necessary to determine the daily workings of the mill.

QUARTZ MILLING:—

Determination of the percentage of free gold and the percentage of sulphurets in the ore.

Cleaning the mercury.

Preparing and dressing the amalgamating plates and silvering of same.

Preparing the silver and sodium amalgam.

Retorting and bullion melting.

Bullion assay.

Fire assay for gold and silver.

Description of all the operations in the mill.

Course V.

THE CYANIDE POTASSIUM PROCESS:—

Description and illustration of the operations in a cyanide plant.

Fire assay for gold and silver.

Humid assay for copper, lead, antimony, and arsenic.

Testing the ore for ferrous-sulphate, and determining the necessary amount of lime or alkali to destroy the ferrous-sulphate.

Determination of the percentage of cyanide of potassium in the solution.

Melting the bullion.

After the laboratory test is complete, running fifty pounds of ore through a working size cyanide plant to determine whether the working test will confirm the laboratory test. If both tests agree, a large cyanide plant may be erected, in all security, in the mine.

Course VI.

EXTRACTION OF SILVER BY THE LIXIVIATION OR HYPO PROCESS:—

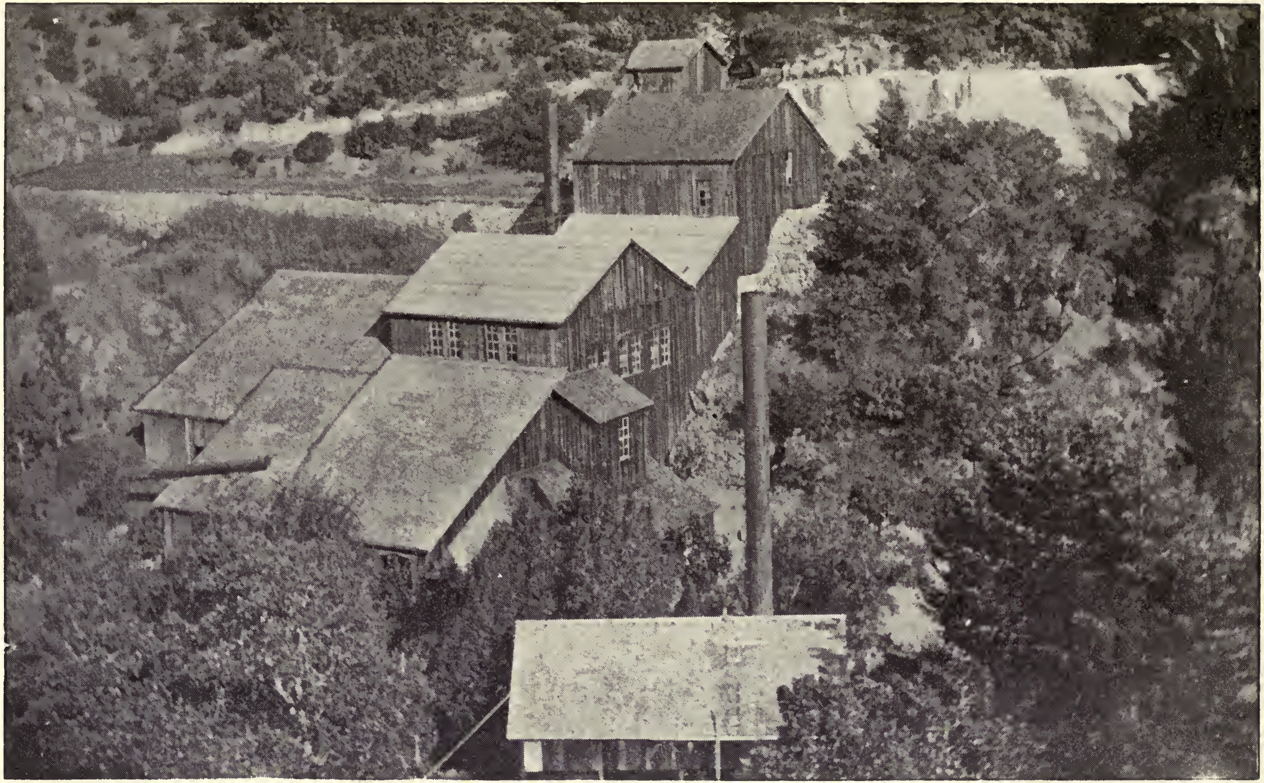
Description and illustration of leaching the silver.
Fire assay for gold and silver.
Humid assay for copper, lead, antimony, and arsenic.
Instruction in chloridizing roasting.
Leaching the silver by hypo.
Preparation of sulphide of lime.
Precipitation and melting the bullion.

Course VII.

GOLD EXTRACTION BY THE CHLORINATION PROCESS:—

Description and illustration of the chlorination process.
Fire assay for gold and silver.
Humid assay for lead and copper.
Determination of the percentage of dioxide in the manganese ore used to generate the gas.
Oxidizing roasting; chloridizing roasting.
Generation of chlorine gas.
Preparation of sulphide of lime.
Leaching, precipitating, and melting the silver.
Chlorinating, leaching, precipitating and melting the gold in the bullion.
Precipitating and assaying the copper cement for the market.

To students taking the full course as detailed above, a short course of drawing will be given to enable them to prepare plans and bills of materials for cyanide plants. This short drawing course has been found by experience to be absolutely necessary to lead the students to the higher positions afforded by the mines.



PALISADE MILL (referred to on another page) ALSO SHOWING MOUTH OF TUNNEL AND CREW OF STUDENTS IN THE DISTANCE

TERMS.

Course I including materials	$ 35.00
Courses I and II, including materials	60.00
Courses I, II and III, including materials	125.00
Courses I, II, III, and IV, including materials	150.00
Cyanide Course, including materials, about 10 weeks	125.00
The Full Course, comprising the seven courses above detailed	200.00

TIME REQUIRED.

Course I about 2 weeks; Course I and II about 4 weeks; Course I to III about 10 weeks; Course I to IV about 12 weeks; Course I to V about 16 weeks; Course I to VI about 18 weeks; Course 1 to VII about 20 weeks.

Students studying courses in the engineering and other departments and who are entitled to courses I and II, are required to pay for materials, $7.50 for first and $10 for both courses, IN ADVANCE.

Students especially prepared to become British Columbia assayers. Time required, about three months. Terms, $150.

Mine owners, prospectors, superintendents and foremen of mills, cyanide and chlorination plants and smelters, will, by taking the full or part of the offered courses, be able to do their own assaying, to determine losses in extraction, find out its causes and be able to remedy it, viz., adopt the best metallurgical treatment for certain ores. The student will be taught to prepare and dress battery plates as practiced in large stamp mills, clean and retort the amalgam and cast it into bullion; or he will be able if called upon, to take charge of any of the enumerated plants as superintendent, foreman or assayer.

Special terms can be made for any course or portion of same.

OIL REGIONS IN CALIFORNIA.

The state of California having developed into an oil-producing country of great magnitude—and we are certain the entire Pacific Coast will follow in the lead—we have decided to add to our courses of instruction, a brief course giving in detail the geological characteristics of oil regions or lands, and intended to guide the prospector in his research for such oils.

We are also prepared to give a practical course in the chemistry of oil, in order to ascertain principally its commercial value.

ELECTRICAL DEPARTMENT.

The present age might be very appropriately called the "Electrical Age," since the applications of electricity have become universal. The time IS NOW, when the engineer, whether civil, mechanical, hydraulic, or mining, who does not understand the principles underlying the science of electricity, is far behind the footsteps of his fellow-engineer who is conversant with these principles and knows how to apply them for the welfare of man.

The subject is generally supposed by the masses to be exceedingly mysterious, and only within the reach of those possessed of a college training, but, fortunately, such is not the case, and any one having ordinary intelligence may, in a comparatively short time, become proficient in the principles of electrical engineering.

Recognizing the fact, in 1886 we added a department of electrical engineering to our school, and we may state that it has been very successful, and many of our electrical graduates have secured remunerative positions, which they fill with honor. All necessary apparatus is provided, not only for purposes of illustration, but commercial instruments as used in actual electrical work, and the student thus comes into contact with, and use of, all the practical appliances connected with electrical engineering. He obtains efficiency in the running and care of electrical machinery, learns how to make all kinds of tests, and, by the time he has completed the course, will be fully competent to design and erect any electrical plant, and superintend the same, to the full satisfaction of all parties interested. A complete course in mechanical, architectural, and electrical drawing is also taught, so that the student may understand working drawings, and draw his own plans, make estimates of work, and design machinery if he desires.

SYNOPSIS OF THE FULL COURSE IN ELECTRICAL ENGINEERING.

Preliminary calculations, to discover the arithmetical attainments of the student; mensuration complete, with its application to surveying a plot of land upon which to build an electrical plant. The study of water tanks, of all kinds and shapes, strength of materials, weight, cost and strength of iron and steel, wood, chains, ropes, trusses, beams, etc., plane trigonometry complete, with its application to mining, enabling the student to understand tangent and sine galvanometers, to read correctly the plans of a mine with all its underground workings, fitting the student to erect electric plants in mines, and ascertain correctly from mine drawings, which are always complicated, the length of the wires needed. The study of trigonometry and its various formulae is essential not only to the practical workings of the electrical engineer, but to insure a perfect understanding of the formulae which a student daily encounters in the various books and publications of the electrical engineering profession. Elementary constructive drawing is taught during the course.

ELECTRICAL COURSE.

The electric current and its properties; definition of unit current; the ampere, current strength; direction and flow of current; current generators; batteries of different kinds; potential difference; electro-motive force; the volt; electric resistance; the ohm; best arrangement of batteries for special purposes; measuring current strength; measuring potential difference or voltage of batteries.

MEASURING INSTRUMENTS.

The galvanometer; tangent, sine and reflecting galvanometer; differential galvanometer; the Watt meter; the volt meter; the ammeter; the dynameter; their theory, construction and uses.

The Wheatstone bridge, its principal construction and thorough elucidation of its uses, is indispensable in determining resistances in electric conductors to correctly locate breaks in either the conductor or its insulation; the construction of resistance coils and boxes.

Ohm's laws and the practical demonstration of their correctness.

Measuring resistances by substitution and potential difference methods.

CONDUCTORS AND INSULATION.

Calculations necessary to determine the area of conductor or size of wire to carry the current required for any particular purpose or work, as lighting railway, mining operations, or general power purposes; insulating materials; testing insulating capacity.

WIRING SYSTEMS.

Thorough instruction in the series, multiple and three-wire multiple systems, and the student will be required to perform actual work until he becomes proficient in all kinds of wiring.

MAGNETISM.

What is meant by magnetism. The permanent magnet and electro-magnet. The principles and useful application of the magnet in electrical apparatus. Magnetic polarity, lines of force, magnetic field, distribution of magnetism in magnets, magnetic susceptibility and permeability. Oersted's

A FEW CORNERS IN OUR ELECTRICAL DEPARTMENT interesting discoveries of the magnetic properties of wires or coils under the influence of the electric current.

Study of magnetism in different kinds of iron by means of curves. Forms of electro-magnets, the most suitable for different kinds of work.

INDUCTION.

Laws of induced currents; electro-magnetic induction; induction coils; telegraph and telephone apparatus, their principles and construction.

DYNAMOS.

Organs of dynamo; theory of the dynamo; windings of the dynamo for different purposes; study of different types of dynamos for lighting, railway, mining, electro-plating, and metallurgy; alternate current dynamos, transformers; armatures and armature winding; regulation of dynamos for constant current (arc lighting), and constant potential (incandescent lighting.)

MOTORS.

Theory, construction, winding, and regulation of motors; designing dynamos for different industrial purposes; all calculations necessary in the designing of dynamos and motors as to length and dimensions of wire for winding armatures and field magnet, and to find the size of the latter, to ascertain the horse-power of dynamos and motors, which enable the electrical engineer to supply the horse-power required for the railway, mining operations, stationary power plant, etc.

STORAGE BATTERIES.

Theory of the storage battery, and the storage of electrical energy for light and power.

ELECTRIC LIGHTING.

Arc and incandescent; arc lamps, their regulation and repair; incandescent lamps. Current meters, direct and alternating.

TRANSMISSION OF POWER.

Railway, mining, and general power plants; study of different types of motors; central station designing and construction; line construction and testing same. Theory and practise of transformers for long-distance light and power transmission.

ALTERNATING CURRENT.

Theory of alternating current, phase and phase difference, explaining difference between single and polyphase generators. Addition of alternating current and electro-motive force (E. M. F.) the result being demonstrated by Vector diagrams and sine waves illustrating the loss of current or E. M. F. in alternating current generators. inductance; power factor; Ohms law for alternating current; magnetic field and ampere turns; application of Vector diagrams; capacity of induction coils.

TRANSFORMERS.

Elementary transformer. Sine curves illustrating the method for calculating accurately the capacity of the transformer. Primary phase relation; secondary phase relation; hysterisis and Eddy current in transformers. Iron loss in transformers; core and copper loss in transformers; magnetic leakage; testing for transformer losses.

THE ELECTRIC RAILWAY.

Construction of the power plant. How to build a power station with the latest improved machinery, and how to operate it; the wiring of the generators; the wiring of the switchboard. The construction of the trolley line; the feed wires; how to construct the road-bed; the rails; the bonding of the rails; the return current; how to avoid electrolysis; the cars; the wiring of the cars; the wiring of the latest improved motors, and series parallel controllers of the General Electric Co., the Westinghouse Electric Manufacturing Co., and several others. How to manage the motor and controller efficiently; the best manner to wind armatures and field magnets for motors with latest improvements; how to build commutators, also trucks of all makes and sizes; the car wheel and breaks. The management of steam engines for railway plants, simple compound, condensing and non-condensing; the care of boilers; how to get the best results from coal.

ENTERING A PLANT.

After the student has completed in a satisfactory manner the entire course in electrical engineering, as detailed above, he can, if he so desires, enter either of two plants in which we have an interest, and are established in two thriving towns of eight to ten thousand inhabitants, where he receives a confirmation of the correctness of the instruction at the school.

The plant is utilized to light the city with both incandescent and arc lamps, as well as supplying current for electric motors.

These stations are in charge of the kindest of superintendents, and "THE FINISHING TOUCH," as he terms it, which the student receives under his direction is of the greatest value.

The student, during his stay at the plant, is conducted through all the phases of practical plant life. Commencing in the fire-room, he is required to examine and assist in cleaning the boiler, trace the connections of all water and steam pipes, and make sketches of same; he is also required to fire the boiler for a week to become confident that he understands the practical workings of the same, with its pumps, injectors, safety valves, blow-off cocks, etc. The boiler-room, though apparently simple, is by far one of the most important parts of a well-designed plant. It is here where defective machinery or careless management gives rise to unnecessary expense and waste, which effects the commercial as well as the technical efficiency of the plant; consequently too much importance can not be attached to the thorough understanding of the steam generating equipment. From the boiler-room the student enters the engine-room, where he assists in running the engine, takes indicator cards, sets the valves from same, etc. The electrical generating machinery next occupies his attention. He is required to operate the several different types of dynamos, becoming more familiar with their peculiarities under varying conditions and the operation of the complex switch-board, with its many circuits, recording instruments, detectors, etc.

Complete tests are also made of the entire plant from the coal bins to the lamps, showing the efficiency of the entire installation.

This being the "electrical era," new discoveries are constantly being made, and we have endeavored by every possible means to have our courses "UP TO DATE," as it were. Printed matter pertaining to almost every recent appliance is constantly at the student's disposal in the schoolrooms, and we have on file many of the technical journals that have come to our notice, for the benefit of the pupils.

In addition to this, the president of this institution makes frequent trips throughout Europe and the eastern manufacturing districts, gathering data and models of the improvements or new discoveries made in the scientific world.

LABORATORY AND WORKSHOP.

In our laboratory and worshop we have an engine, ordinary and screw-cutting lathes, with the necessary tools and machinery. Nothing is more conducive to a perfect understanding of the laws of the electric current and its application than the construction of galvanometers, the Wheatstone bridge, ampere and volt-meters, dynomos and motors, etc.

We state with no small amount of pride that the mechanical skill displayed by our students is really remarkable. Five medals have been given to them by the Committee on Awards of the California International Exposition for their very meritorious exhibit of an electric railway in full operation. The pretty little cars, complete with truck, motors, trolley, incandescent lights, dynamos, engines, switch-board, rheostat, power-house, track, with poles and wires, switches, etc.

It is with a feeling of pleasure, and no small measure of thanks toward the superintendents of electric plants, that we are enabled to state that our students have always been welcome to every electric plant they have visited, and the entire system cheerfully explained, whether they were plants for light or for electric railways.

They have, moreover, been invited to visit the power-houses as often as their instructor may deem profitable. The favor granted by these broad-minded officials is of great benefit to the students, and the school often avails itself of the privilege.

ATTAINMENTS IN CIVIL ENGINEERING WHICH AN ELECTRICAL ENGINEER SHOULD POSSESS.

The student having completed his electrical studies, will now be instructed in the use of transit and leveling instruments, with thorough practice in the field, enabling him to run the lines for an electric railway, make profile of road, establish grades, calculate quantity and cost of earthwork, construct roadbed, put in simple, compound, and reverse curves, as may be required. He will be shown the very important equation or rule of raising the outer rail on curves, according to the rate of possible speed, this being the only safeguard against the cars jumping the track, causing the terrible accidents which nowadays happen only too often, and which may cause financial embarrassments to railways, through the heavy damages the courts invariably condemn them to pay for broken limbs and lost lives. The construction of bridges, trestle-work, open-timber culverts, with estimates of cost, will also be taught in this course, as well as the architectural requirements necessary to enable him to erect power-houses, boiler-houses, machine-shops; in fact, all buildings required in an electrical plant of ordinary magnitude. The students are then taken to the Hall of Records, where they are made familiar with the official subdivisions of towns, and to the office of the City Engineer, where they obtain the official grades of streets, these grades being a very important factor in the calculations of the electrical efficiency of such railways in cities.

Topographical drawing, complete, will be taught in this course.

MECHANICS.

It is essential that a student desiring proficiency as an electrical engineer should have a good knowledge of the science of mechanics. We have, therefore, selected from our course, leading to the profession of mechanical engineer, such facts as are deemed essential to the electrical engineer, a synopsis of which here follows:—

"Units of work, and units of time; their application to raising materials, etc., the moving of bodies on different planes, the lever, pulley, screw, wheel, and axle, with many practical examples to be worked out by the student to insure full understanding.

"The study of velocity, momentum, action, and reaction.

"This followed by the study of the steam engine in its main parts; different kind of engines; the complete study of indicator and indicator cards, and the results they show.

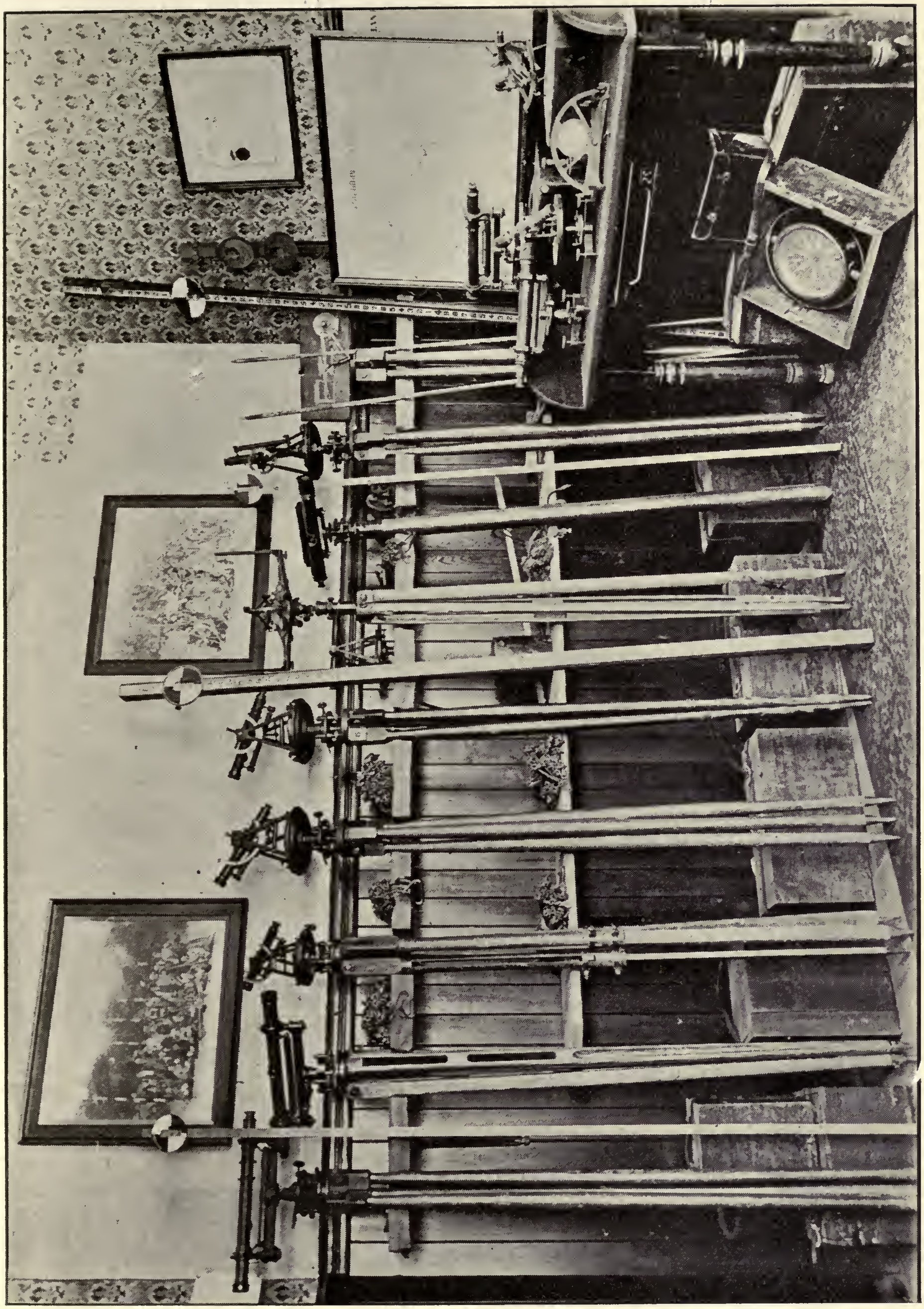
"The determination of horse-power for single, double, and tri-cylinder engines; with explanation and illustrations, enabling the student to determine the most efficient and economical engine for any plant with the erecting of which he may be intrusted; also, a thorough course in mechanical drawing."

The electrical engineering course complete, requires twelve to eighteen months.

To steam engineers, or others not having time to take the complete course of electrical engineering, we give the opportunity of taking the special course. The special feature of this course—the students being all men of sound, practical common sense—consists in giving them the practical applications of electrical science. They receive special attention, select special branches, and need not follow the regular course nor take up any of the studies which their peculiar occupation does not seem to require. This course consists of the care and management of dynamos and motors, lamps, etc., of all kinds, the testing of armatures for short circuits, testing of lines for breaks in conductor or insulation, and location of same, repair of armatures and arc lamps, etc. A full set of testing apparatus is provided for students, and also dynamos and motors of commercial size. The time required for this special course is about three months. Terms $100 in advance.

COURSES WILL BE GIVEN IN ANY SPECIAL BRANCH OF ELECTRICAL ENGINEERING ON TERMS TO BE AGREED UPON.

The course, either regular or special, may be taken in several sessions to suit the time the student can bestow to study; for instance, an engineer on a steamer may pursue his study whenever his ship enters port.



A CORNER IN OUR INSTRUMENT ROOM

HYDRAULICS.

Owing to the exceptional facilities which the Pacific slope affords for the development of water-power from its numerous streams and water courses, as well as the problem which has been solved of efficiently transmitting electrical power over long distances, a large number of power plants have been installed during the past two years. The electrical engineer is thus more or less identified with the science of hydraulics, and we give below a synopsis of a course which we deem indispensable for an electrical as well as a mining engineer to possess:—

I. ELEMENTS OF HYDRAULICS.

1. Pressure.
2. Velocity.
3. Space.
4. Time.
5. Area of Orifice.
6. Volume.
7. Friction.

II. ORIFICES.

III. LONG PIPES.

1. The general characteristic.
2. The formula of resistance.
3. Velocity of flow in long pipes.
4. Quantity of discharge.
5. The diameter of pipes.
6. Pressure in long pipes.
7. Strength of pipes.

IV. WATER SUPPLY SYSTEMS.

1. The elements to be considered.
    - a. The quality of the water.
    - b. The quantity of the water.
    - c. The distance to be traversed.
    - d. The dimensions of pipes.
    - e. The reservoir embankments.

V. THE GAUGING OF STREAMS.

1. Determination of mean velocity of a river.
2. The cross-section of its bed.
3. The volume of discharge.
4. The pilot tube.
5. The Weir.

VI. RESERVOIRS.

1. The site of the reservoir.
2. The construction of the reservoir.
3. The calculation of cut and fill.

VII. EMBANKMENTS.

1. The earthen dam.
2. The rubble-masonry dam.
3. The masonry dam.

VIII. THE MINER'S INCH.

IX. THE GAUGING OF RAINFALL.

X. METHODS OF GATHERING AND DELIVERING WATER.

1. The gravity system.
2. The pumping with reservoir reserve.
3. The pumping with direct pressure.
4. The three systems compared.
5. The tank stand-pipe.

XI. SOLUTIONS OF PROBLEMS.

XII. SURVEYING OF SITES FOR RESERVOIRS AND OF THE STUDY OF CONTOUR LINES, BOTH IN OFFICE AND FIELD, WITH CLINOMETER.

Frequent trips are made by the students to some convenient water course where careful instruction is given in estimating and measuring the available horse-power of the stream, as well as in the selection of the most suitable sites for dam, flume, pipe line, and power-house.

INDORSEMENTS OF A FEW OF THE ELECTRICAL AUTHORITIES OF THE PACIFIC COAST.

By the Employment of many of Our Students.

Pacific Gas and Electric Company of San Francisco.
Bay Counties Light and Power Company.
Great Western Power Company.
Oroville Water and Electric Company.

Geo. P. Low, president California Electrical Society; permanent vice-chairman Section of Pure Practice, Congress of Electricians at Chicago,

A. VANDER NAILLEN JR.

ORE PICKING

THE REAL THING

At the Mines

former electrical engineer Pacific Insurance Union, former editor Southern Pacific Journal of Electricity.

Northern California Power Co.
St. Helena Light and Power Company.
Napa Light and Power Company.
Santa Rosa Light and Power Company.
Suisun Light and Power Company.
Sonoma Light and Power Company.
Fleishacker Electric Plants.
California-Nevada Electric Company.
The Martland Electric Company, S. F.
Electrical Appliance Company, S. F.
Louis Glass, manager Pacific Telephone and Telegraph Co.
United Railroads of San Francisco.
Wm. Goodwin, manager Sterling Electric Co., S. F., and many others.

MECHANICAL ENGINEERING.

The course of mechanical engineering comprises preliminary calculation, mensuration in all parts, solids, pitch of bolts, rivets, etc.; square measure, problems involving length. breadth, depth, and weight of parts, pumps, horse-power, pressure and steam pressure, cut-off of steam, consumption of fuel, draught and consumption, evaporation, rate of speed, trust strength and heating surface of boilers, strength of seams, boiler pressure, stress of shafts, etc.; crushing stress, shearing stress, tensile strength, stress on beams; friction; temperature, and heat, gravity, falling of bodies; mechanical powers, viz.: the lever, pulley, the wedge, screw, wheel, and axle, inclined plane, lap and lead, slide valve, indicator card calculations, and defects in engine as shown by cards, horse-power figured from cards; bolts, stays, gearing, and the steam engine in all its parts drawn from specifications. Drawing from models and by scale, connecting rod, crank, shaft, feed check valve, dead-weight safety valve, side discharge valve, eccentric rod and sheave, stop valve, throttle valve, link motions and all parts of steam engine, etc.

The above course requires from six months to one year.

TO APPRENTICES WISHING TO BECOME MECHANICS.

According to the saying of many of our prominent manufacturers and builders, the present system of sending young men to the shop as apprentices before they have acquired any notion of drawing, or a rudimental knowledge of the purposes and means of their trade, is entirely wrong. One of our most prominent engine builders told us, while bringing his son to our school for instruction, that the apprentices are knocked about the shops and are put at old and unprofitable jobs for a couple of years before they can really commence to learn anything about the trade, and render any valuable services to their employer. "I want my boy," said he, "to learn drawing first, have a notion about machinery, know the names and functions of all parts of an engine, how to calculate the strain these parts will have to bear, and hence find the necessary dimensions of the material to withstand these strains. With these preliminary attainments my son will be able to comprehend from the day he enters the shop all the work being done in it; will be interested in what is being built, and I am confident that in this way he may save two-thirds of the time of his apprenticeship; moreover, he will avoid the discouragement that overtakes most of our best apprentices, when discovering how little progress they make in their trade, and how little time the foreman can bestow on their instruction." We earnestly command the above to the consideration of all parents who intend their boys to learn a trade. The remarks of this engine-builder apply to all trades in existence. We believe, as this gentleman said two years' apprenticeship may be saved by taking a course in our school before entering the shop, and a course of three months, during the day, at a cost of $50, or six to nine months at our night school, will be sufficient.

SPECIAL COURSE FOR MACHINISTS.

It is absolutely necessary that a machinist should have a good understanding of drawing; without it, he is a mere machine himself, hardly above the level of a planer or screw-cutting lathe; he is debarred of all progress, unable to carry out or understand the idea of others, and, what is most lamentable, utterly incapable of putting his own idea upon paper. Every machinist endowed with an ordinary amount of brains can not refrain from observing everything that is going on around him, and so notice deficiencies here and there in the labor-saving machines actually in existence. If he could easily put on paper the results of his observations, he would soon find some contrivance to remedy these deficiencies, obtain a patent for his improvements, and thus often make a fortune. In our school drawing is taught in all its branches from models and parts of machinery; side views, top views, end views, cross sections are all explained. The calculations connected with drawing are also thoroughly taught, so that a machinist does not only learn to make the parts of a machine, but also what size to make them, and what is the best form to give them to withstand effectually the strains they will have to bear.

In the above course, models are used.

MARINE, STATIONARY, AND GAS ENGINEERING.

Engineers under this heading are thoroughly prepared in mathematics for examination of any grade such as required by the Government Inspector and Marine Engineers' Association, fire department engineers, etc. Requires from two to four weeks' time. Terms, $25 in advance.

COURSE OF ARCHITECTURE.

First and Second Courses.—Remarks on architectural proportions, as applicable to private houses, illustrating the method of preparing plans, showing the exterior and interior arrangements of houses, in order to make the same intelligible to the contractor and mechanic; preliminary detail of house, from sill to roof-plate, explaining all parts of construction, with correctly figured sketches, mode of determining the cost of labor and material from the plans and specifications, manner of preparing these plans and specifications for ordinary frame houses, and other important matters of great value to the mechanic and contractor. The above two courses require about six months. Terms $125.

Third Course.—This course will include the higher branches of tuition. Architecture, embracing the construction of brick, iron, and stone buildings; higher branches of details, explaining more difficult combinations, also method of detailing stone, brick and iron fronts, with method of laying out and detailing staircase work. Master mechanics are especially invited to attend this higher course. The third course requires three to five months. When taking in connection with the calculation of statics, dynamics, strength of material, designing, steel construction, Class A buildings, the structural and reinforced concrete courses as specified under head of Structural Engineering, the whole architectural course takes about twelve months.

TO CARPENTERS AND BUILDERS.

Every carpenter and builder knows how absolutely indispensable it is for him to know drawing, to understand every drawing that is submitted to him. A special course in architecture is given at our school to mechanics who are directly engaged in building. Carpenters and joiners will be taught the manner of obtaining the shape of raking moldings, form of stair strings and rails, mode and manner of laying out work, estimating cost of labor and material and other necessary qualifications for their trade. This will require about three months' special course. Terms $75.

COURSE OF STRUCTURAL ENGINEERING.

The large amount of construction work which has been in progress on the Pacific Coast during the last few years has created a demand for structural engineers and draughtsmen which has exceeded the supply. There is great need of men who can design and erect steel and reinforced concrete structures such as bridges, buildings, roofs, towers, and a multitude of other constructions in which steel and concrete must be used. This is especially true at this time in San Francisco and vicinity, where most of the buildings are being erected to withstand fire and earthquake.

In the large cities, fireproof buildings are being built, and experience has shown that steel and reinforced concrete, or a combination of these, gives the greatest strength and fire resistance.

To meet this demand for trained stuctural engineers, we have arranged a special course in structural engineering. We have studied, besides the steel structures, the various systems of reinforced concrete in Europe, especially in France, and have consulted with the most successful architects of our own country, regarding the erection of reinforced concrete structures. Finally, after much study and labor to reduce intricate math-

READY TO ENTER TUNNEL AND MAKE COMPLETE UNDERGROUND SURVEY AND REPORT OF MINE

A PRACTICAL LESSON IN UNDERGROUND SURVEYING ematics to very simple calculations, we have completed a course of structural engineering especially adapted to the needs and requirements of architects, draughtsmen, contractors, foremen and mechanics.

Our course is given along practical lines; we do not teach from books, but from actual practical examples, so that the student becomes not only familiar with the theory of structural design, but also with the details of office practice. Our students, when they finish the course, are capable of working out complete designs and making full shop drawings according to the practice of the best offices.

We give this course by individual instruction and hence a student may enter at any time and at any stage of advancement. Architectural and mechanical draughtsmen, who have some knowledge of the strength and design of materials, will have a great advantage in following this course, and if they so desire may take up any special feature of structural engineering that is suited to their particular needs.

Mechanics, carpenters and steel workers employed at structural work should understand something of engineering, in order to advance themselves to responsible positions in their line.

An outline of the full course is given below, but we can and do arrange the course to suit the needs of any student who desires to specialize more on some particular subject.

A great many wish to pay especial attention to reinforced concrete, and to these we offer marked advantages for making a specialty of this Course. The large amount of building in steel and reinforced concrete being done at present in San Francisco and Oakland makes our location an ideal one, since it gives the student facilities for observing the actual erection of an enormously large number of class A structures.

SYNOPSIS OF FULL COURSE.

STEEL CONSTRUCTION.

The Steel Companies' Hand Books, such as "Cambria" and "Carnegie," are introduced early in the course, and the student is given thorough instruction in their use.

1. Theory of forces and application to loads, reaction, and bending moments of beams and girders.
2. Properties of sections.
3. Strength of material.
4. Design of beams, girders, and connections.
5. Strength of masonry and design of bearing plates.
6. Plate girders.
7. Design of columns and struts.
8. Foundations and column footings.
9. Details. Shop and office practice.
10. Grapho-statics.

11. Design of roof trusses.
12. Design of bridges, towers, tanks and other special work.
13. Wind bracing.
14. Fireproofing of steel buildings.
15. Specifications and complete designing of steel structures.

REINFORCED CONCRETE CONSTRUCTION.

1. Testing and mixing of cement and concrete.
2. Strength of concrete.
3. Theory of reinforcing.
4. Design of columns.
5. Design of beams and floor slabs.
6. Foundations and retaining walls.
7. Forms.
8. Various systems of reinforced concrete construction.
9. Complete design.

The courses are given both in the day and evening classes. The time required for day students to complete the full courses is about six months.

The time required for evening students to complete the full courses will be about one year. The evening students are supposed to do some home work as well as the day students.

Terms for both classes of students:

Full course	$125.00	about 6 months
Steel construction alone	$100.00	about 3 months
Reinforced concrete alone	$75.00	about 3 months

As stated elsewhere, the evening classes meet on Monday, Wednesday and Friday evenings from 7 to 9 o'clock.

A special twentyfour weeks' evening course in structural work for carpenters, mechanics, etc., etc.,

Terms for drawing and calculations, $7.50 *per month.*

Further information and terms on application.

THE SPECIAL COURSE.

Since 1874 experience in California has clearly proved to us that many men in the mines, in railway corps, or those employed in various capacities in the technical or industrial professions, can not spare the time required by our regular course to acquire the instruction indispensable to attain a higher position and thus improve materially their conditions in life. For persons whose time is thus limited, we have a special course, and this has been attended by mining superintendents, members of various engineer corps, foremen on bridges, architects, surveyors, etc. The special feature of this course consists, the students being all men of sound practical common sense, in giving them—to use a vulgar phrase, but one expressive of our meaning—"*the plums of the pudding.*" They receive special attention, select special branches, and need not follow the regular course, nor take up any of the studies which their particular occupation does not require. On the other hand, however, whatever branches we teach must be thoroughly mastered, for they will surely face the graduate one day or other. This course has given great satisfaction, and is attended by men of all ages, some of whom are in the sixties. Invariably all who have taken this course have, at its completion, said, "*How I wish I had taken this course years ago!*" Still, we must state that it is far better for all students whose time is not limited, to follow the regular course of our school.

CONTRACTORS COURSE.

We have a special short course for contractors of all grades. Many of our leading contractors have taken this course which enables them to make close estimates from all kinds of plans, and for any kind of construction, which in these days of keen competition is a vital point. This course can be obtained by the busy contractor by devoting a few hours now and then. Terms and time required for this course given upon application.

OFTEN WE ARE ASKED,

"How can it be possible to learn these different branches in so short a time?" Hence our answer: Because we do not teach from text-books; the student receives individual instruction (no classes) from PRACTICAL MEN, WHO HAVE BEEN THROUGH THE MILL. The instructors being practical civil engineers, government experts, court authorities, U. S. deputy mineral, licensed state and government surveyors, practical electrical, mining, and mechanical engineers, assayers and chemists, and since the different departments are in charge of these practical men, we are constantly contracting and securing work of all kinds, and during the last twenty years have built up quite a business in OUTSIDE WORK, thus giving the students actual and practical experience, and when profits are made on these JOBS, the student also comes in for a share of it. *We claim this a special feature of our school which to the best of our knowledge no other school passesses.*

In addition to the above the student is instructed by the use of many models, machinery and their parts, working models, etc.

As elsewhere stated, the president of this school every year or two goes to Europe, making a thorough visit of the larger scientific institutions, to learn from some of the world's greatest educators the latest in science which would be of benefit to our students, having thus far made twelve trips. All this costs a great deal of time, money and years of experience, which is absolutely necessary to build and conduct an UP-TO-DATE engineering institution.

SESSION.

The school is open summer and winter without intermission, from 9 a. m. until 4 p. m.; evening classes, Monday, Wednesday, Friday, 7 to

9 p. m. Scholars are admitted at any time, as each receives a separate course of instruction.

Students can select any specialty they desire, and study separately any of the branches taught in the school.

A special feature of our school is that we allow any student who can not go through a full course of studies at once, to remain with us as many months at a time as his circumstances will permit, thus enabling him to resume his studies at any subsequent period. Should time be due him, it will be placed to his credit, thus giving a student an opportunity to make terms so as to include all advantages offered. *In no case will tuition be transferable.* Absence of less than one week at a time will not be deducted. The secretary must be notified of all intended absences. Money paid for tuition is never refunded. Whenever a sudent wishes to shorten the time of study, or for any other reason does no longer desire to continue the regular course, he can transmute the balance of his time into the special course at the rate of $30 per month. All special branches selected must be thoroughly studied, as we will absolutely not give or teach a "SMATTERING" of any part of our courses.

DIPLOMAS.

After years of hard work, for it takes many years to build up a successful school of practical engineering, and having placed hundreds of graduates who are today occupying positions of importance and trust, we believe we have amply proved our worthiness to rank with the leading institutions of the U. S., and consequently have incorporated, and our charter authorizes us to issue diplomas and confer degrees upon graduates on an equal footing with our universities.

BOARD AND LODGING.

Arrangements can be made with us to place students in private families. Terms $22.50 per month and upwards.

Many of our students have been able to secure work of various kind after school hours, which in many cases has paid for their living expenses. A number of our students have formed a Bachelors Club, which has proved successful and less expensive.

For shorter or longer Special Courses, special terms made on application.

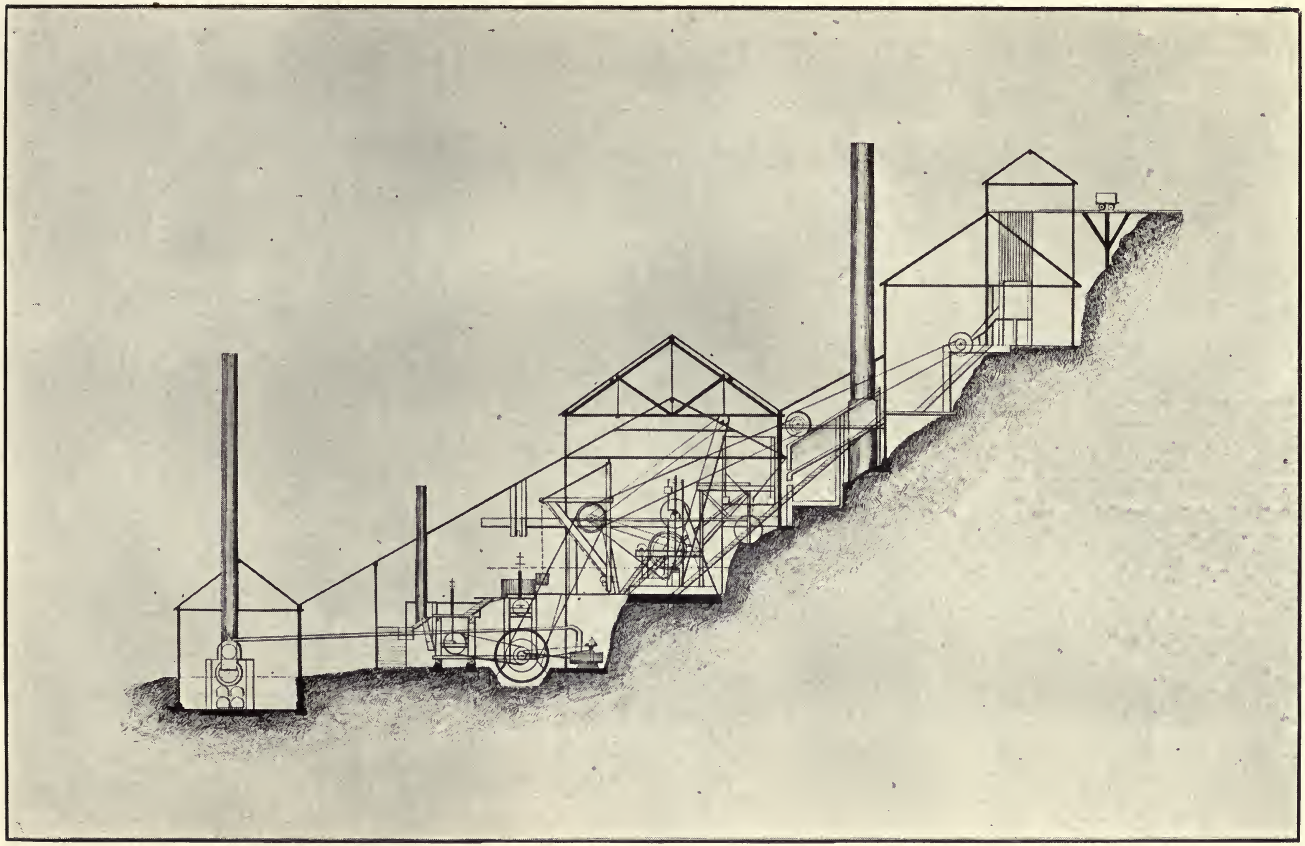
SCHOOL PINS.

Students entering for the regular course receive the same as at the universities, a college pin at manufacturer's price.

EVENING SCHOOL FOR MECHANICS.

Monday, Wednesday, Friday, 7 to 9 p. m.

Drawing and calculations needed by mechanics, TAUGHT IN TWENTY-FOUR WEEKS, such as required by mechanics, carpenters,



DRAWING MADE FROM MEASUREMENTS TAKEN BY STUDENTS IN THE PALISADE MILL builders, bricklayers, stone-cutters, masons, mill-hands, apprentices and mechanics of all grades. Terms $7.50 per month or three months for $20 in advance. Apprentices, $5.00 per month.

The same instruction is given in the evening as in the day classes in all the branches.

The students taking this course perform most of the drawing at school, and work the calculations at home. They are verified by the instructors while the student proceeds with his drawings.

WHY OUR SCHOOL IS PRACTICAL.

Now, after we have stated with much earnestness the necessity of making technical schools *more practical* in their courses of instruction, which means that the students, on leaving school, should be able to fulfill with satisfaction to their employers and to themselves, the duties, however complex, of any position that may be intrusted to them in the particular engineering line they have studied, parents and others have an unquestionable right to ask what *we* have done to render *more practical* and efficient the courses of instruction followed by the students in *our* institution. In answer to this legitimate question we will relate here some *practical work* performed by the heads of our institution, with the efficient assistance of the students, who have followed all and performed many of the field operations with perfect understanding, and to the entire satisfaction of their professors, and of the parties interested.

SURVEYING AND ENGINEERING.

Surveying of the Walter Renwick Ranch in Napa County.

The deed to this ranch was a miserable piece of business, the beginning of the description of the land was at a certain tree, and the last course instead of closing at the same tree, ended at a distance of nearly five chains from the point of beginning; moreover, the deed took in a part of a Spanish grant to which the owner was not entitled. After having taken the official notes in the surveyor-general's office, the crew of students, with their instructor, went to the land, and, after a careful investigation and correct running of lines, the true intent of the deed of conveyance was ascertained, and deeds of correction drawn up, to the satisfaction of all parties interested. The students did patient and correct work in the survey, and the practical experience derived from this difficult piece of work was invaluable to them.

We will here remark that the surveys intrusted to the head of the school are always surveys that are in dispute, the owners of the land desiring an adjustment of their lines by competent and disinterested persons. Surveys covering eighty-five miles of lines delimitating oil claims more or less in dispute in the oil fields of California have already been run by us. These surveys were made at the request of the Oriental and Portland Oil Companies and others, and this kind of work still continues to the satisfaction of the companies.

Surveying of hundreds of city lots in San Francisco, Oakland and other cities where absolute accuracy is required, these lots being often worth from one to five thousand dollars a front foot. This trains the student in all methods of correct measurement, and teaches him how to hunt and find from the City Hall records, the correct notes for locating the lots according to law.

Another engineering work requiring great care, was the adjustment of grades of the lot upon which Saint Paul Church in San Francisco was to be erected. These grades must conform exactly to the official grades of the streets of the city as adopted by the Board of Supervisors.

During an annual trip for field practice in Wooden Valley, Napa County, the students, under the supervision of their instructor, adjusted the boundaries of several ranches which have been in dispute for eighteen years. This great achievement was arrived at through the determination of the students to find a witness tree which was recorded in the United States notes, but as yet undiscovered by any surveyor; it is true, the official notes placed it in an almost inaccessible rocky part of the country, but the boys never tired till they found it. The blaze or official mark was overgrown with six inches of new wood; a little seam, however, was left in the bark, and following up this indication, the new wood was cut away and the marks appeared as shown by photo on another page. That night there was big rejoicing in camp, and the farmers interested gave a big spread the day following, and I am not sure but the entertainment wound up with a dance.

One of our instructors was sent to the H. I. as chief engineer for the Spreckel interests there and constructed $300,000 of engineering work. This institution also furnished one of its firm to act as chief engineer for the P. & S. R. E. R. R. which was completed and constructed mostly by our students who not only received good salaries, but excellent experience during many months.

Much other actual and important field work was done, but too long to enumerate, all proving to the students the immense importance of *actual practical work.*

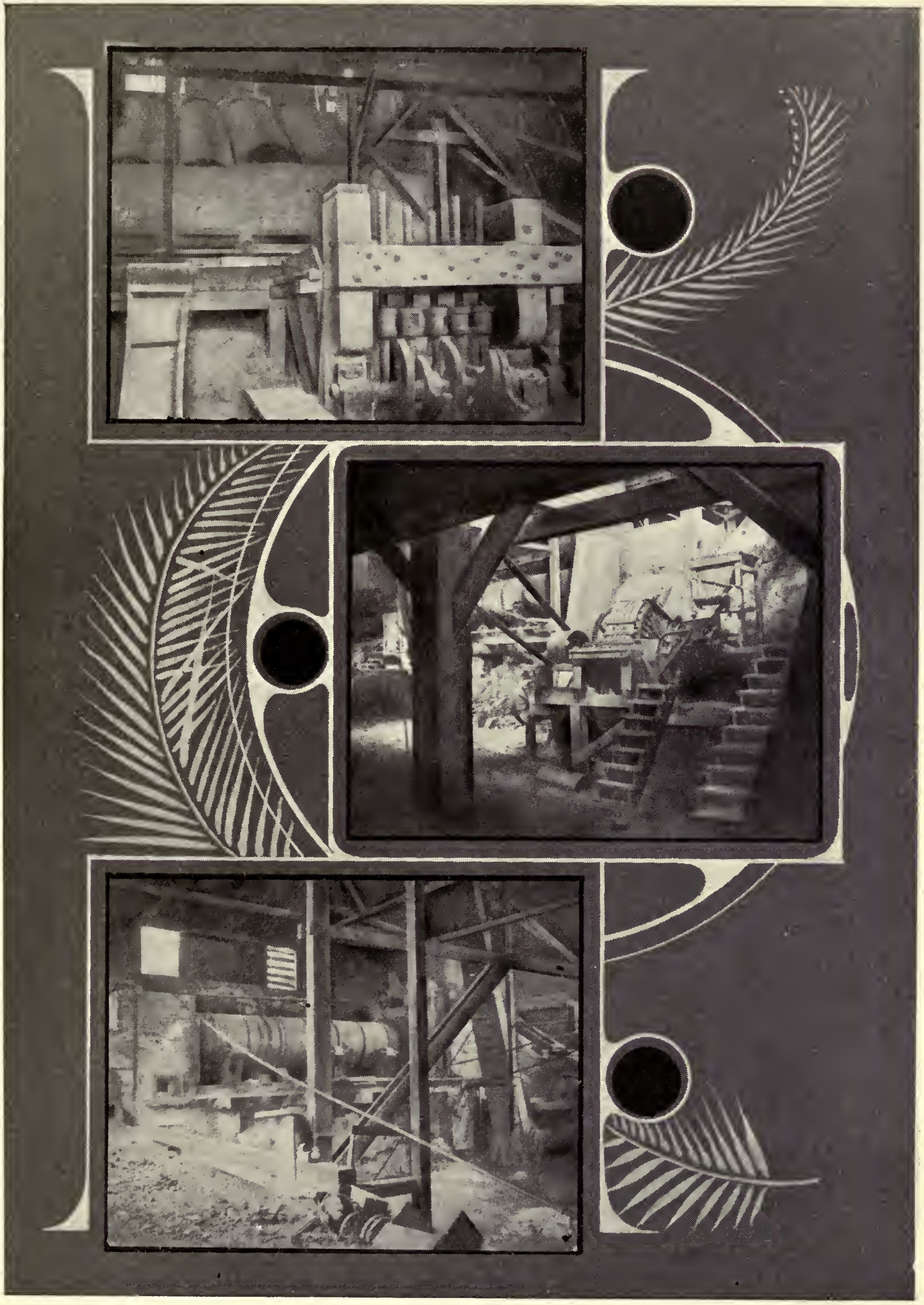
MINING AND ASSAYING.

Complete underground and surface surveys were made of the Oat Hill, New Idra, Ida Easely and many other mines. Maps were accurately drawn of these mines, which were greatly to the credit of the students.

Many mining claims and mill site boundaries which were in dispute were surveyed according to the Federal mining laws, affording invaluable practical instruction.

EXPERT WORK.

Six weeks were spent in field work and laboratory tests on the Blue Ravine mine, the object being to determine whether the one hundred thousand tons of tailings were worth the expenditure of putting up a plant to work them, and, in the affirmative, which would be the most economical process to extract the gold. Thirty sacks of samples were



SEVERAL INTERIOR VIEWS OF THE 10 STAMP MILL AT THE PALISADE MINES taken from the tailings and a great number of assays made, which showed that these tailings could be worked profitably. A five ton mill test made by the owners proved the correctness of our laboratory work.

Over two hundred and sixty assays were run at school for different mining companies during a period of six months.

Surveys have been made for several quicksilver mines in Lake County, in order to make an underground connection. After several months of tunneling, and expenditure of considerable money, we had the satisfaction of learning that the connection was made absolutely correct.

Beside the above, many surveys were made, plans drawn and erroneous titles of land and claims corrected, all of which were of immense practical value to the students.

As proof of the confidence our practical field work inspires, our instructor was appointed by the Napa County Superior Court, to establish the true boundary lines of the Green Mountain mine, which had been bitterly disputed, ending by the killing of one of the interested parties. This delicate piece of work, demanding extra care and attention, as perhaps a human life depended upon the results of the survey, afforded exceptional practical instruction to our boys, many of whom helped us efficiently in the work.

The Mechanics' Institute of San Francisco, some years ago, decided to hold a *Golden Jubilee Mining Fair*, to celebrate the fiftieth anniversary of the discovery of gold in California. Mining exhibits from all counties were contributed, as well as a splendid array of all appliances used in mine workings, and the extraction of the precious metals from the ores. One of the greatest features of this Golden Jubilee Fair was a real mine built full natural size; under large grounds of the fair were tunnels, crosscuts, winzes, shafts, inclines, elevators, rock crushers, blasting chambers, etc. The board of directors of the fair, a very progressive and competent body of men, got the very practical idea of having a complete survey made of this mine, which was named the Golden Jubilee mine, horizontal and vertical projections, showing all the stoping, workings of every description, with a complete set of maps. The students of the engineering schools of the state were invited to make a survey and draw plans of the mine, holding out as a reward to the best, most correct, and neatest work, a diploma of honor. A photograph on another page shows that to the students of our institution was awarded this diploma of honor against all competitors.

PRACTICAL WORK DONE BY THE ELECTRICAL DEPARTMENT.

The return of the California regiment of volunteers from the Philippines in August, 1899, was an event which will long be remembered by those who witnessed this magnificent and enthusiastic reception. One of the most attractive features of this celebration was the elaborate electrical display, the first of its kind to this date in San Francisco. Many thousand incandescent bulbs illuminated the line of march, and countless others displayed the outlines of the City Hall and Ferry Buildings. The successful carrying out of such a plan, in the short space of time allotted, was an engineering feat of no small proportions.

The construction and erection of this work was placed in the hands of the head of our electrical department, who enlisted the services of all his students, and, despite the fact that only material enough for half the number of lamps could be obtained from the dealers on such short notice, sockets, ets., were improvised and the undertaking proved a grand success.

It is needless to state that irrespective of the financial benefit derived by the students in this case, the great amount of practical experience which they gained was of immense benefit to them.

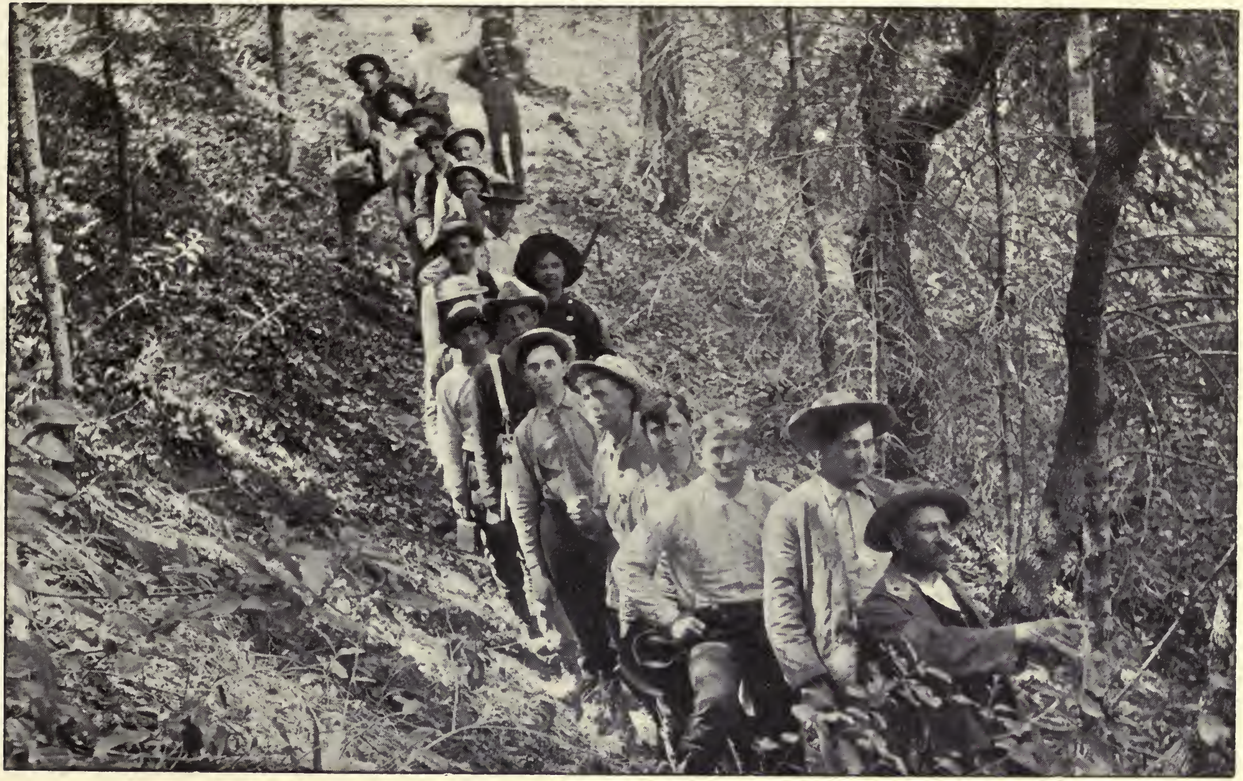
During a certain season a large number of the students in the electrical department were engaged in surveying the course of the Paper Mill and Lagunitas Creeks in Marin County. Divided in crews, the pupils alternately surveyed the meanderings of the streams, selected and surveyed the site of a dam, ran the levels for a flume and pipe line from the dam to the selected site of the power house, as well as running the preliminary lines and final locating of pole lines, after which accurate hydraulic measurements were taken to estimate the available horsepower of the streams, The benefits accruing to the students on such trips as these are inestimable.

Shortly after the sensation caused by the announcement that messages were being sent through space without wires, by Marconi, the associated press was sending dispatches to all parts of the globe, stating that the first messages by wireless telegraphy in America, which proved successful beyond expectations, were sent by the head of our institution and much praise was given to the experiments of our electrical class of 1898. We were indeed proud of the success of our pupils after witnessing their untiring efforts in building the apparatus for this interesting experiment.

Space will not permit us to go into the details of the reconstruction of the entire Santa Rosa plant, also the working of the Oroville Water and Power Plant. The preliminary work of building an electrical railway from Piedmont to Walnut Creek and many, many other electrical constructions which have been in charge of the heads of this institution.

IMPORTANT.

If you desire to study bookkeeping and follow a business career, you should attend a regular up-to-date business college, where all the attention is directed upon the exclusive teaching of business and bookkeeping. There you will find an excellent course of business instruction. If, however, you desire to study engineering in any branch, go to a REGULAR school of engineering, recognized by the entire engineering profession, and there you will find the entire attention of the instructors centered upon imparting most valuable technical engineering instruction. It takes a long and varied experience in the engineering fields to enable the head of an engineering school to complete a course of instruction which will cover all the professional requirements that a graduate may encounter in the field.



AFTER HAVING SURVEYED AND CUT A LINE ON THE NORTH BOUNDARY OF THE IDA EASELY MINE

The experience of ONE man, no matter how many years of actual practice he may have in his engineering career. is not sufficient to constitute a complete course of instruction. It has taken us certainly fifteen years since the opening of our school, in 1864, to complete the perfect course we give today. Our graduates on leaving us were and are instructed to send us a detailed statement of all new engineering problems which they might meet in the course of their career, covering special cases and newly discovered methods of construction or contrivance.

Many of these we receive weekly, the most worthy of which we include in our course, and we can truly state that now, as we have many hundred graduates in all parts of the world, our courses are made up of the actual lifelong experiences of hundreds of our best engineers.

TERMS FOR REGULAR COURSE. (*Invariably in Advance*).

For all or any of the various branches (except in assaying and metallurgical department.)

Six months' tuition including use of two instruments and assay course I, $125.

Nine months' tuition including use of three instruments, assay course I, and bullion assay, $150.

Twelve monts' tuition including use of all instruments at any time, assay course I and II, $200.

For shorter or longer courses, special terms made on application.

For showing use of either transit, leveling instrument, solar compass or any other instrument, with practice in the field:

1 instrument	$15
2 instruments	25
3 instruments	35
All instruments	50

It often happens that the twelve-month student, although paying but $200, will require eighteen months' time or more, because the time he is occupied in actual work, for which he receives some compensation, is not counted as tuition time.

Special terms can be made to those who wish to take less than six months' tuition.

A student who takes a year's course has many advantages:

First. Has the privilege of using all instruments from the day he enters.

Second. Has first call (if competent) upon situations and outside work.

Third. The assaying course I and II without extra charge for tuition.

SPECIAL COURSE.

Three months' tuition, including use of one instrument, $100 to $125.

Four months' tuition, including two instruments and assay course I $125 to $150.

Five months' spcial course including transit, level and solar transit or compass and assay course I, and bullion assay. $150 to $175.

Seven months' special course, including use of all instruments, assay course I and II, $200

Or special terms can be made to suit any particular case in any department.

E. L. Vander Naillen, C. E.
Genl. Manager

A. Vander Naillen, Jr., C. E.
President

R. Leo Vander Naillen, E. E.
Secretary

California Engineering Co.
(INCORPORATED)

GENERAL CONTRACTORS

Civil
Electrical
Mining
Structural
R. R. Construction
City and County Surveying

Metallurgists
Assaying
Cyaniding
U. S. Dept. Mineral and Official State Surveyors

420 KEARNY STREET
San Francisco
Oakland Branch
51st Street and Telegraph Avenue
Phone Piedmont 54

The following appeared recently in one of the S. F. daily papers:

There is a steady demand for the services of young engineers here, by the Western Pacific and other railroad enterprises, as well as by the many electric railroads and power plants which are being constructed all over the country, uniting small towns and villages. The industry of mining is taking every day a greater importance, owing to the discovery of many new gold fields, and increased progress in the oil fields is giving rise to many new industries. The rebuilding of San Francisco and many other engineering enterprises have compelled many corporations to send East for their engineering forces, as the supply was short on this coast.

ASSAYING DEPARTMENT

The Middle Picture shows a Student 80 Years of Age, who upon the completion of his Course said: "Had I known this 20 years ago, I would today be a millionaire."

Lower Picture shows a Double Cyanide Plant.

FACTS CONCERNING OUR SCHOOL.

Have hundreds of graduates all over the country who are successful engineers and who when they need assistance in the engineering line, naturally send to us. Why? Because they know the class of students who come to us are WORKERS.

A student who accepts our offer of a position while at school is necessarily paid for his work and moreover we allow him his tuition time while so occupied.

Consequently it might take 24 months or more to complete his 12 months course and he may have more money in his pocket at the end of the course than he had when he started in We claim no other institution offers these same advantages

We also claim as shown by our business card on another page to be practicing Engineers engaged in actual work.

The success of our insitution is mainly due to the fact that the President of this school and his three sons are practical engineers.

That we throw in the course of assaying for gold and silver without extra charge for tuition, as a student without this knowledge may never be aware when he is stepping over a fortune when out in the hills.

That we do not obtain students by advertising as we practically do very little of it. Those who come to us have usually been recommended by some graduate or well known engineer, or corporation, or company who have employed them.

That we have proven by the hundreds of successful graduates who are to-day well known engineers and chief engineers that our method of practical individual instruction is a great success. Twelve months is enough. This is proven by our many graduates. We can do for YOU what we have done for hundreds of others who are on top to-day if you will do your share, and this will be easy as the work is interesting and work that is interesting is certainly easy. All we want you to have is a little GOOD HORSE SENSE AND BACK BONE AND WE WILL DO THE REST.

THE FOLLOWING ARE A FEW EXTRACTS FROM HUNDREDS OF LETTERS WE HAVE RECEIVED FROM STUDENTS.

Bitumen Clinton O., Pa.

My Dear Professor: Am still practicing my old profession and am pleased to say I have been more than successful, have made plenty of money. About two years ago I met my old classmate, Wm. Martin, who is Government Engineer in charge of the Davis Island Dam at Atlantic City. It is very pleasant for me to think of the pleasant hours we spent together nearly thirty years ago.

GEO. L. MILLER,
General Superintendent.

Graduated in 1867.

Seluckue, Matabeland, South Africa.

Am now getting $500 per month. Tell your students for me to get in and work while at school and follow your instructions, and I will guarantee them that they will come out all right; my own case has proven it so. Have often wondered how you had the patience to put up with your cranky students. Make your boys go out in the field. Your old scholar James is growing rich fast in Johannesburg.

JOHN D. CASSERLY,
Mining Engineer U. M. C. D. Co.

Puerto Cortes, Honduras.

Have studied at Freiberg for many years, but I must confess that your method of practical instruction in the field has been of great value to me in making surveys and examinations of mines during my recent trips in Central America, Mexico, and California.

CARL VON REISCHACH,
Mining Expert.

Santa Cruz, Cal.

Dear Professor: I always knew you cared more about us boys than the actual cash you got out of us. My mountain trip with you and the actual work has been of the utmost value to me here.

H. W. H. PENNIMEN,
Licensed Surveyor.

Stockton, Cal.

Do not send me a man unless he can master the instruments in the field.

E. E. TUCKER,
City Engineer.

Graduated from this school in 1871.

San Diego, Cal.

Your school is all right.

THOS. SHAW.
City Engineer.

Germiston, Transvaal, Southh Africa.

I am sorry I was unable to remain long enough to complete my course. Am doing well.

THOMAS F. COSGRIFF.

Stockton, Cal.

I trust my old professor well be successful.

FRANK H. GOULD.

Vanden, Cal.

I consider it an honor to have been one of your scholars.

GEO. WOLLENSCHLAGER.

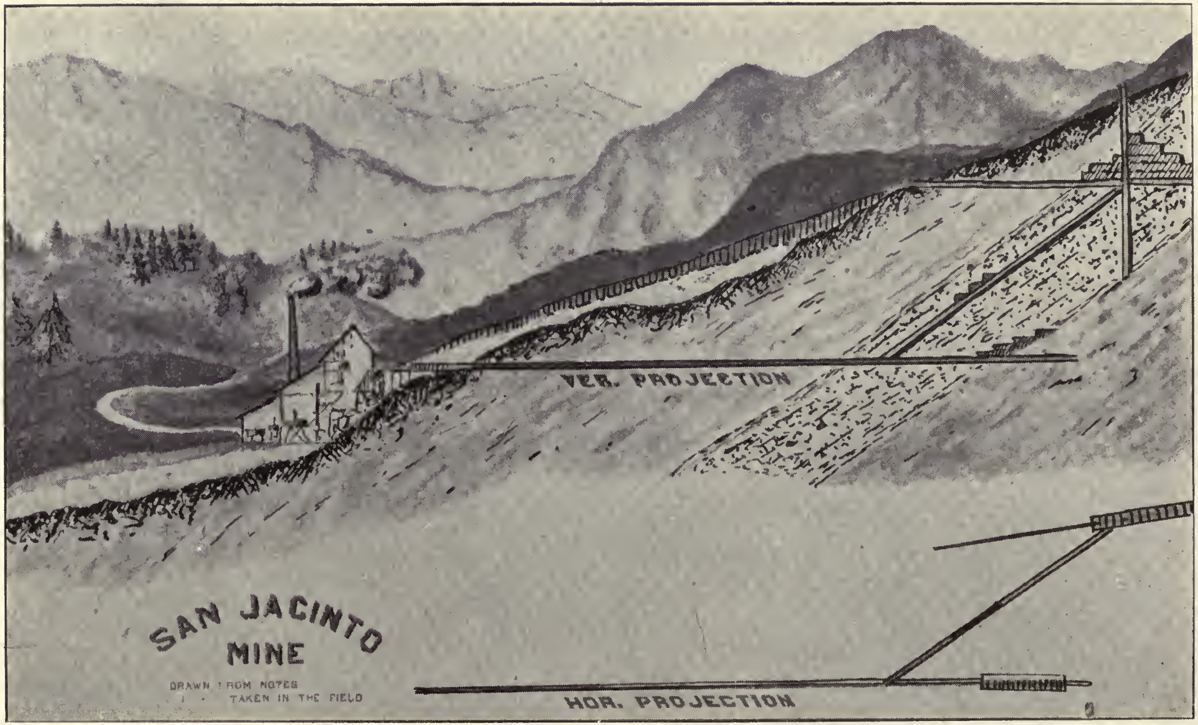


PHOTO OF DRAWING MADE BY STUDENT FROM HIS OWN NOTES GATHERED IN AND OUT OF THE MINE IN ADDITION TO MAKING MANY ASSAYS AND A FULL REPORT

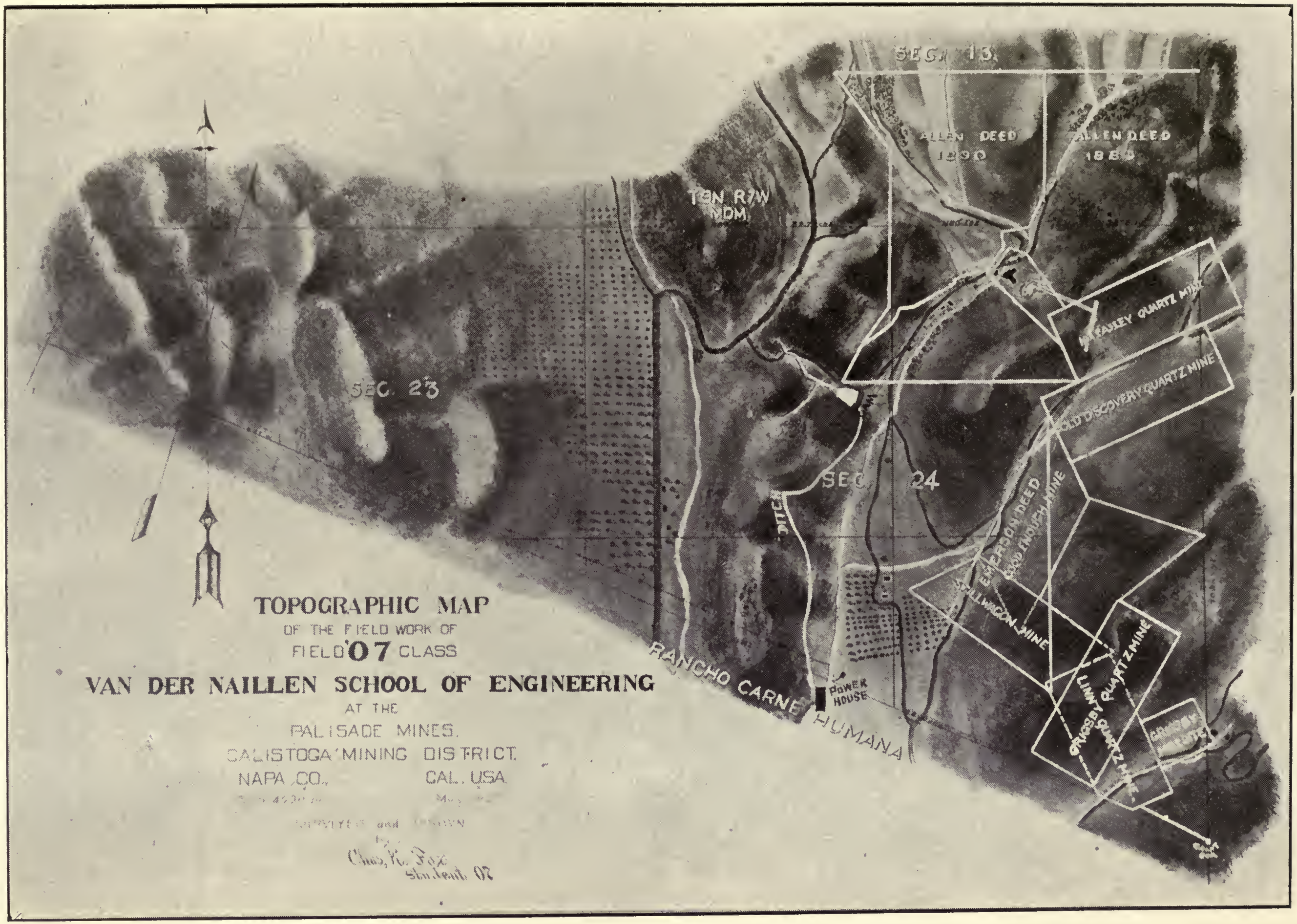


PHOTO OF TOPOGRAPHICAL MAP MADE BY STUDENTS FROM NOTES OBTAINED BY THEIR OWN SURVEYS SHOWING CONFLICTING BOUNDARIES OF MINING CLAIMS

Orange, Cal.

I am a surveyor of over forty years' experience, and I think you are doing noble work. You are building the right kind of engineers.

JOHN F. HALSTED, C. E.

French Gulch, Cal.

I have employed several of your graduates, who have all given entire satisfaction.

CHARLES JEFFERSON CLARK,
Mining Superintendent.

Send me an assayer for gold and silver, etc.

LOUIS GLASS,
General Manager Pacific Tel. Co., S. F.

Jacksonville, Cal.

I thank you for all you have done for me. I am all right now and hope some day to come back to school and finish my course.

C. JURGENSON.

Martina, Montana.

Am more than satisfied with the course I took. My map made a great hit.

J. W. WOODFORD.
Superintendent N. M. M. Co.

Dean, Nev.

Have a good job but will be back in October to finish my term.

E. MATTESON.

Vacaville, Cal.

Was advised to send you my ores to be assayed, as you are reliable.

R. F. RAMMERS.

La Grange Mines, Weaverville, Cal.

Have full charge of the ditch survey and doing well. Although I was with you but a short time you have my good will, and will always speak well of the school.

A. R. GURREY, JR.

Wooden Valley, Napa County.

You caused quite an excitement here by changing those boundaries, but everybody is satisfied.

BILL LYONS.

Yerrington, Nev.

I have full charge of the chemical and assaying department, and so far the company is well pleased with my work.

ALEX D. CONNELLY,
Boston and Nevada M. Co.

Colgrove, Los Angeles Co.

I will go back to take six months more as soon as I settle my mining affairs.

PAUL LEPOIDS.

Golden Gate Mine, Grass Valley.

I see how much more field work I need. Will certainly be back to school at the first opportunity.

ANDREW FURREY.

If you have a young man leveler send him at once, as I can procure for him a good position. (Has furnished many positions.)

JOS. C. SALA,
Instrument Maker, 48 Second St., S. F.

To the A. Van der Naillen School of Engineering:

Your school has been awarded the DIPLOMA OF MERIT for best survey and map made of the Jubilee mine against all other competitors.

JUBILEE MINING FAIR COMMITTEE.

La Duna Mining Co., Sonora, Mex.

Our mine employs about 1,260 men, so I have my hands full. Am getting a good salary.

A. T. GRAFF.

Callahans, Cal.

I am truly grateful to you for all you have done for me in and out of school.

E. W. NOLAN, Licensed Surveyor.

Although 'tis many years since I attended your school I have not forgotten you. I want an assistant in a short while. You know what I want. Have one ready.

JAMES A. LOW,
Supt. Honolulu Sugar Plantation Co.

Blagowestchenk, Amoor River, Eastern Siberia.

Dear Professor: I realize more and more how much knowledge I gained at your school. I would not part with it for $5,000.

CONSTANTINE KRASILNIKOFF.

Greenville, Ohio.

The interest you display in your students does not stop with the expiration of their term at school.

CHAS SLADE,
Asst. Eng. Water Works.

Junction City, Trinity Co., Cal.

Am engaged on an engineering job that is a corker, running a 30-mile mining ditch through a very rough country.

E. G. LOVERIDGE.

San Francisco.

Can hardly realize we could acquire so much practical knowledge in so short a time.

J. O. and HENRY HECHTMAN.

Warden, Idaho.

I have made some very important underground connection surveys since I left your school. One of them had 4,000 feet drift, with thirty-four stations and 308 feet between tunnels, and had the satisfaction of knowing they came out O.K.

JAMES P. KEANE.

Torres, Sonora, Mex.

Have full charge of engineering department, underground work connections, winzes, tunnels, etc., all made here same as I was taught by you. Am well pleased with the course I took with you.

H. L. MOULDER.

Redding, Cal.

Am well satisfied with the course I took with you.

M. J. GLEAVES, JR.,
Chief Clerk Surveyor-General's Office, S. F.

Sutter Creek.

Am well pleased with the course of assaying I took at your school.

WM. R. THOMAS,
Supt. Central Eureka Mine.

Amador City.

Have had occasion to check against the Selby Smelting Lead Co., Voorhees & Barney, and my results so far have been very satisfactory.

C. W. TERRY,
Surveyor and Assayer, Keystone Mining Co.

San Francisco, Cal.

It is twenty-two years since I attended your school, and I have ever since been recommending it to many young men.

HENRY C. LANGREHER,
U. S. Deputy Mineral Surveyor.

Mt. St. John, Napa County.

Getting along O.K. Check with County Surveyors, corners everywhere.

J. ERNEST GARDNER (19 years old).
(In full charge of surveying party).

The usual letter of recommendation our students receive from their employers:—

The Kootenay Railway & Navigation Company (Limited),
General Office, Kaslo, B. C., August 8, 1900.

Christy Maack, Esq., Asst. Engineer—Dear Sir: It is with the greatest pleasure and confidence that I bear witness to the unvarying satisfaction that has attended your term of service with this company.

To any one who may be desirous of obtaining the services of an all-round engineer, I may confidently advise him to try the bearer.

Mr. Maack has now been with the above company for the past four years; during that time he has been engaged upon intricate land and mineral surveys and railroad work in all its stages, preliminary and location surveys and construction. Last year he was resident engineer and in full charge of some fourteen miles of railway construction to the north of Kootenay Lake, Kaslo & Lardo-Duncan Ry., and just lately in the same position upon the completion of the Kootenay Valley and Redlington & Nelson Rys., and in my opinion the varied experience and responsibility relating to work upon small roads, will stand him in good stead anywhere.

Mr. Maack is further a rapid and effective draughtsman and shows his technical training.

I have to regret the circumstances that necessitate your departure, but hope that the company may be in a position to offer you sufficient inducement to return. Yours truly, J. H. GRAY,
Chief Engineer and Land Commissioner.

Mr. Maack came to us as a young ambitious farmer from Petaluma, and after one year's course was competent to fill the above position.

Chief Engineer Van der Naillen, of the San Francisco and San Mateo Electrical Railroad, takes the officers of the road on a trial journey.—S. F. ''Call,'' October 23, 1893.

The A. Van der Naillen School of Engineering has again been awarded highest honors at the Mechanics' Fair.—S. F. ''Evening Post.''

We have examined with care the A. Van der Naillen School of Engineering course of electrical engineering, and do not see why any one should not gain a good knowledge of electricity.—''Pacific Electrician,'' S. F.

I believe your school to be the right place for ambitious young men.—San Francisco ''Journal of Electricity.''

The distinguished Russian parties now visiting our mines are in charge of R. Van der Naillen, of the A. Van der Naillen School of Engineering, of San Francisco.—''Trinity Journal,'' February 6, 1897.

Merced, Cal.

Am having more work than I can attend to.

ARTHUR COWELL,
County Surveyor.

Aetna Mine, California.

Am getting along admirably. The bosses treat me tip-top. Will be back to school soon.
EDW. QUINN.

San Francisco, California.

Next Monday we place in your charge the young man de la Roche, from Mexico. We hope he will do as well as the others we have sent to you.
W. LOAIZA & CO.

Canyon City, Colorado.

I know when I get a certificate from you I can get a situation on the new electric road being built here, as they have had some of your students.
S. S. THOMPSON.

Suisun Electric Plant.

Have employed many of your students who always give satisfaction, have three now.
LEONARD PRIOR, Prop.
Ex-Graduate.

Mariposa, Cal.

Have you a young man whom I could make a deputy and who would be willing to take my office? I have too much outside business to attend to.

Your ex-student,
S. J. HARRIS,
County Surveyor.

San Francisco, Cal.

Send me another young man who is good at draughting.
DUNDON'S IRON WORKS.

Coronado Water Co.

Everything I am doing here, both in the office and in the field, is just like I learned it while at your school.
A. ERVAST,
(Chief Engineer).

Vancouver, B. C.

Leave for South Africa to-morrow; $300 per month and expenses, thanks to your school.
ALEX. MUIR.

Friebaugh, Fresno Co., Cal.

Tell the boys to by all means avail themselves of the opportunity offered in your school for field work. How shall I repay you for securing me this dandy position?
ED. F. LIPPERT,
Asst. Eng. to E. P. McCray, Chief Eng. to Miller & Lux.

Pasadena, Cal.

Many thanks for your effectual showings in the ''Morning Call'' that I was not a long-haired cowboy. I thought your student had long passed out of your mind. I leave for Africa again January 1.

F. R. BURNHAM,
The famous Mining Engineer of Matabeleland, Africa.

THIS PHOTO SHOWS A GROUP OF SOME OF THE USUAL PRACTICAL MINERS OF ALL AGES, WHO COME FROM THE DIFFERENT MINING COUNTRIES TO LEARN OUR PRACTICAL METHODS IN ASSAYING AND METALLURGICAL WORK

Susquehanna.

Dear Professor: Inclosed please find annual pass over the entire system of the Susquehanna & Buffalo R. R.

Your old pupil, GEO. MILLER,
Chief Engineer.

Sacramento Car Shops, Draughting Department.

It was your school that gave me a good start in life. I can hardly realize I was only six months at your school. My boss would hardly believe it.

GEO. VON BODEN.
Oil Expert S P. R. R.

Belle Josephine Mine, Callahans, Cal.

Recommend a young man from your school and I will employ him at once.

ALFRED BOUVIER, ex-student,
Supt. and Propr. Belle Josephine Mine.

Belle Josephine Mine, Callahans, Cal.

Arrived all safe; lots of chance for good work. I will never forget you. Right out of school into a good job. FRED KELLETT.

Honolulu, H. I.

Be sure the man you send thoroughly understands field work.

E. L. VAN DER NAILLEN,
Chief Engineer Spreckels Sugar Co.

McKittrick, Cal.

Ran twenty-five miles and have not yet found a corner. It's a tough proposition locating these oil claims, but I get there, thanks to the practical experience I had with you. I shall ever feel under obligations to you for this good situation. R. C. MACLACHLAN.

Calmalli, Baja, Cal.

I have done some very good underground surveying, the connection coming out exactly. Many thanks for your efforts in securing me this position.

D. M. MUNRO.

Candelaria, Mine, San Duinas, Durango, Mexico.

I need as good a man as you made of me. I feel honored to see my name among your list of graduates and will try always to be a credit to your institution. AL. J. EVENS,
Mining Engineer and Assayer for Col. D. Burns.

Apollo Mine, Unga Island, Alaska.

Have advised our superintendent to send his son to your school; when I come to San Francisco shall attend your school again.

FRANK A. BROWN,
Superintendent.

Sonora, Cal.

I made a perfect connection on a 350-foot level last week in the Rappahannock mine. Thanks to practical knowledge obtained at your school.

JOHN G. HOPPER,
County Surveyor.

Elee, Elee, H. T.

Dear Professor: A thousand thanks for offering me a good position, but I have a good one. L. L. MANN.

Bisbee, Arizona.

Our mining engineer, Mr. Ben Williams, indorses your school and methods. Will be down as soon as possible. C. F. NICHOLS.

Cruiser Charleston.

The few months at your school has enabled me to fill position of first electrician on board the Charleston. E. H. LOWE.

McCloud, Calif.

Have Crooks, Mincher, and Freyer with me making four of your ex-students in charge. E. E. HALL,
Chief Engineer, McCloud River Railroad Co.

Sonoma, Calif.

Am having splendid practical experience in all kinds of electrical work. Mr. Van Hoosier, the superintendent, your former student, is never tired of explaining things to me. C. L. KAUFFMAN,
Electric Light and Power Co.

San Francisco, Cal.

Have again recommended a young man to by all means go to your school. WARREN MURRAY,
Chief Engineer, Spreckels Sugar Refinery.

Manila, P. I.

Am now in charge of the engineering work for the Atlantic, Gulf & Pacific Co. EDW. I. CLAWITER.

Honolulu, H. T.

Your diploma was the means of me being selected as engineer for the Board of Public Works. E. A. SOUTHWORTH.

Chicago, Ill.

I very often have occasion to make good use of the practical training received in your school. ROBT. A. ILG,
Ilg, Electric Co., Chicago, New York.

Colgate, Calif.

Only here six weeks and been promoted to second operator. I owe my success to my few months practical work in the school plants.
WARREN NEWBY.

U. S. Dept. of Agriculture.
Sonora, Calif.

Have worked two years for the Government without losing a day. I owe my success to the practical training received at your hands.
BYRON O. LOVELACE,
Forest Surveyor.

Oil Center, Calif.

Got a good raise in salary the second month and now have full charge.
ALEX. BARTON,
Eng., Associated Oil Co.

Stone Canyon, Calif.

Have three of your boys in my engineering crew, Bergerson, Miller, and Lavelle, who are giving good satisfaction.
F. A. HORSWILL,
Superintendent (graduate '02.)

San Francisco, Calif.

Am recommending the bearer to take up the architectural course with you.

M. J. LYON,
Architect.

San Francisco, Calif.

We have opened an office and feel competent to do any business in our line. Thanks to you.

MAYER & HOLEMS,
Civil and Mining Engineers.

Susanville, Calif.

Had I not had the practical field work which I did while with you I could never get away with boundary complications I am meeting with.

THAD McKAY,
County Surveyor.

Stockton, Calif.

Thanks to you for my appointment as official surveyor. Have just bought a $263 Transit and am going to start in for myself.

GEO. W. BROADHURST,
W. P. R. R.

Blair, Nevada.

Doing very well financially, thanks to my all-round training in mining received at your school.

H. W. MacFARREN.

Matehuala, Mexico.

I attribute my success to the schooling I got with you.

HENRY C. SCHMIDT,
Supt. Natl. Metallurgical and Mining Co.

Calistoga, Calif.

You are giving your students the real thing in underground surveying.

R. F. GRIGSBY, E.M.
Former Supt. Tahoe Mine, Mexico.

Sumpter, Oregon.

Send a good man as assistant superintendent. You know what I want.

W. S. KEITH (ex-student),
Supt. Oregon Smelting Co.

Sumpter, Oregon.

Was raised to $110 before I had been here a month.

E. J. JONES,
Asst. Supt. Oregon Smelting Company.

Salt Lake, Utah.

I can pass any examination on electrical subject I took with you.

SANFORD WIXSON,
Salt Lake Engineering Works.

Hamilton, Calif.

Have a splendid job with the American River Electric Co. Am working under McKay and McLachlan, two of your former students. Will be back to finish up.

HARRY DUNNING.

Stone Canon Mine, Calif.

The practical mine surveying we did at the Palisade mines is now of great benefit to us.

ELMER G. BERGSON,
EDWIN MILLER.

A SPLENDID CLUB AND BOARDING HOUSE ONE BLOCK FROM THE SCHOOL. A HOMELIKE PLACE WITH READING ROOM AND ALL THE COMFORTS OF HOME WHERE STUDENTS CAN LIVE AT LIVING RATES

Manton, Calif.

Will be glad to send to you for help when there are vacancies. Have quite a number of the former students to work.

H. A. TEDFORD, (ex-student),
Supt. Northern California Power Co.

Lovelock, Nevada.

I have more work than I can attend to at $10 a day. Could not make good were I not practical. Thanks to the Palisade trip.

L. C. MAYER, M. E.,
U. S. D. M. Surveyor.

Portland, Oregon.

From a drug clerk to chief engineer of the Western Contracting & Engineering Co. I owe you much. ERNEST GARDNER.

Sonoma, Calif.

Am pleased to state that all the students I have employed here have given satisfaction.

J. E. VAN HOOSIER,
Supt. S. V. Electric Power Co.

San Francisco, Calif.

Although it is nearly 25 years ago since I was a student with you, the knowledge I gained then is valuable to-day. One of my treasures is the diploma I received from you.

WILLIAM N. CONCANON,
Gov. Contractor and Engineer.

Joliet, Ill.

From information obtained in Goldfield was advised to send my son to your institution to learn practical mining. He will leave here at once.

PAUL O. DRINKWITZ.

Port Townsend, Wash.

Am still here in the Government employ and doing well.

R. A. DAVIS.

Merced, Calif.

Have left the good job you were the means of securing for me here and have gone to Lake Tahoe for a still better one.

HARRY J. ROSE,
Electric Co.

Bay Shore Cut-off.

Working from both ends of a tunnel on a curve when the connection was made. The cross hair of my transit hit dead center.

HENRY KOENIG, C. E.
S. P. R. R. (student of '01).

Montezuma Mine, Costa Rica.

Entirely due to you that I am able now to be in full charge of the 400-ton mill here.

W. G. FRENCH.

Goldfield, Nevada.

Your assaying and metallurgical course is indeed the real thing in regards to being practical.

WM. TOM KINS.

Fresno, Calif.

I owe much of my present success to your institution.

B. E. CRONKITE,
City Engineer.

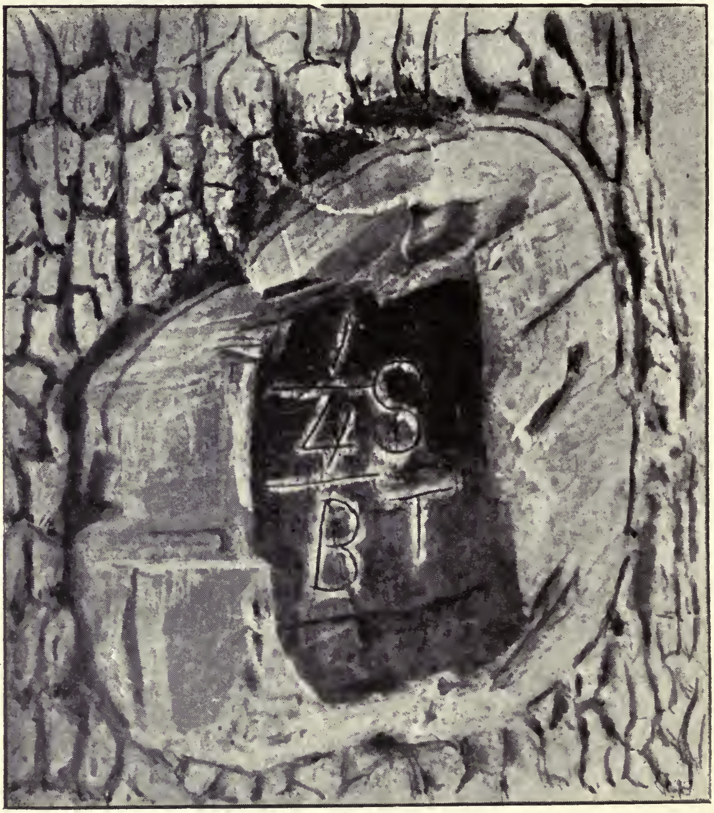
Accept with compliments from the author this book on "Reinforced Concrete" by Ernest McCullough, graduate of '87.
Chief Engineer Northwestern Expanded Metal Co., Chicago, Ill.

Extract of letter received recently from a graduate of over forty years ago:

St. Louis, Mo.

Since graduating with you in 1865 was eight years with the Mo. Kan. and Texas Railroad in charge of engineer's department. Then built a road in southeast Kansas, four years with A. T. & S. Fe Railroad as locating engineer. Have built railroads in Old Mexico and Peru. From '86 to '88 was in Okalahoma, Arkansas, and Indian Territory. '88 to '90 was doing general engineering in Nevada, then chief engineer of Belt Lines, Wiggins Ferry Co., St. Louis. Am now chief engineer St. Louis and North Arkansas Railroad. S. W. LEE.

WE COULD CONTINUE TO GIVE THESE EXTRACTS UNTIL IT WOULD FILL A LARGE BOOK, BUT SPACE FORBIDS.



Old Government Tree in Napa County, lost for eighteen years and found by Students after chopping through six inches of overgrown bark, referred to on ~~preceding~~ page. 52

OFFICIAL STATE SURVEYORS.

The following are the names of a few of our former students who have been appointed Official Surveyors, many of them being also County Surveyors and City Engineers.

This list shows the number to be more than twice that of all the other institutions combined on the Coast, whose graduates are Official Surveyors.

Wm. L. Peck, Yuba City, Cal.
A. G. Gassaway, Forest City, Cal.
V. J. Rowan, Los Angeles, Cal.
I. Teilman, Fresno, Cal.
Samuel J. Jackson, Mariposa, Cal.
Carrol McTarnahan, Sonora, Cal.
Thos. Shaw, San Diego, Cal.
Geo. E. Washburn, San Francisco, Cal.
Chas. Z. Soule, San Francisco, Cal.
C. M. Phinney, Sacramento, Cal.
John J. McMillan, San Jose, Cal.
J. F. Weston, St. John, Cal.
Chas. W. Henderson, San Luis Obispo, Cal.
Geo. Sandow, San Francisco, Cal.
Chas. W. Guptill, Yuba City, Cal.
Victor H. Woods, ex-Surveyor-General, San Luis Obispo, Cal.
H. C. Langrehr, San Francisco, Cal.
James B. Cowden, San Francisco, Cal.
James M. Gleaves, Jr., Asst. Surveyor-General, Redding, Cal.
D. L. Jones, Sonora, Cal.
Jos. A. Graham, St. Helena, Cal.
H. W. H. Pennimen, Santa Cruz, Cal.
Ernest McCullough, San Francisco, Cal.
Fred W. Stickney, Little River, Cal.
John G. Hopper, Sonora, Cal.
A. L. Finney, Modesto, Cal.
Samuel L. Waller, San Francisco, Cal.
Edw. W. Nolan, Callahan, Cal.
A. R. Talamantes, Santa Ana, Cal.
C. P. Christensen, Randsburg, Cal.
Edw. F. Lippert, Seattle, Wash.
Paul E. Lepoids, Los Angeles, Cal.
Alfred Solano, Los Angeles, Cal.
H. E. Weston, Willows, Cal.
Robt. L. Reading, Redding, Cal.
Jas. M. Barney, Menlo Park, Cal.
A. M. Vivier, San Francisco, Cal.
Geo. H. Freiermuth, San Francisco, Cal.
Ernest S. Wheeler, Manila, P. I.
Wm. A. Foster, Los Angeles, Cal.
Chris. P. Jensen, Fresno, Cal.
J. W. Bowden, Briceland, Cal.
A. L. Glassell, Los Angeles, Cal.
Chas. E. Sloan, Berkeley, Cal.
Raymond Houx, Colusa, Cal.
Arthur E. Cowell, Merced, Cal.
L. L. Mann, Honolulu, H. T.
Warren E. Murray, San Francisco, Cal.
Henry C. Schmidt, Matehula, Mexico.
Chas. W. Garside, Juneau, Alaska.
Geo. H. Freitas, Modesto, Cal.
Ernest Gardner, Portland, Oregon.
Harry Griswold, San Francisco, Cal.
Chas. K. Fox, Pomona, Cal.
P. E. Lamar, San Francisco, Cal.
John L. Stubbs, Lower Lake, Cal.
Wm. G. Utschig, San Jose, Cal.
Arthur Grigsby, Calistoga, Cal.
Chas. W. Terry, Confidence, Cal.
A. J. Nielsen, Lemoore, Cal.
R. C. Maclachlan, Hollister, Cal.
Burt. E. Cronkite, Fresno, Cal.
Thad McKay, Susanville, Cal.
Howard Holmes, Alameda, Cal.
J. H. Broadhurst, Stockton, Cal.
E. J. Mayer, San Francisco, Cal.
Burt. Montgomery, Woodland, Cal.
Guy E. Pierce, Placerville, Cal.
Wm. Schuld, LaPorte, Cal.

A CORNER IN ONE OF OUR LECTURE ROOMS

LIST OF SOME OF OUR GRADUATES.

A FEW OF NEARLY 20.000.

CIVIL ENGINEERS.

George L. Miller, Chief Engineer Ligonier Valley R. R., Penn.

D. E. Miller, Assistant Chief Engineer Mexican branches Atchison, Topeka & Santa Fe R. R., Pueblo, Colo.

E. E. Tucker, City Engineer and County Surveyor, Stockton, Cal.

Chief Engineer Stockton & Visalia Railroad.

W. F. Peck, Chief Engineer, Marysville, Cal.

Chas. Howard, City Engineer, Chicago, Ill.

E. D. Minor, Surveyor Columbia Co., Wash.

Norman J. Wilson, Constructing Engineer Oregon Railroad.

J. C. H. Stutt, Consulting Engineer, S. F., Cal.

E. C. McClellan, Reno, Nevada.

E. P. Everett, County Surveyor, Yolo Co., Cal.

Thomas M. Shaw, Gov. Engineer, San Francisco. Cal.

Chris. M. Fitzgerald, Assistant Coast Survey, U. S.

V. J. Rowan, City Engineer, Los Angeles.

Bradford Wheeler, Division Engineer, Roseburg.

Will J. Rust, Asst. Engineer S. V. & M. R. R. Plumas Co.

I. Tielman, City Surveyor, Fresno.

James Owen, Chief Engineer, English S.S.

D. M. Munro, Engineer, Prescott, Ariz.

J. W. Phillips, County Surveyor, Trinity Co., Cal.

Wm. Martin, Chief Engineer, Davis Dam, Monongahela River, Alleghany City, Penn.

Manuel V. Ortega, M. E., City of Mexico.

J. F. Morrow, S. P. R. R.

Gustave Vides, Gov. Engineer, San Salvador.

J. F. Weston, County Surveyor, Glenn Co.

A. S. Addition, Mine Expert, S. F.

C. P. Jensen, Asst. Engineer, Fresno.

W. H. Murray, Chief Engineer Western Sugar Refinery, S. F.

W. Beers, City Engineer, Greenville, Ohio.

J. Ellison. Chief Engineer Cal. Exploration Co., Cal.

Henry Lahiff, Placerville, Cal.

Charles Z. Zoule, San Francisco.

Thos. Humphreys, Eng. U. S. Q. M. D., Spokane.

George Hill, Auburn Cal.

C. A. Luckhardt, Yosemite R. R.

F. Littlefield, Superintendent Corral Hollow Mines.

B. E. Cronkite, Asst. Engineer, Fresno.

L. Brooks, Asst. McC. R. R. R., McCloud.

J. Salsbury,, Tonapah.

Chas. K. Fox, Pomona.

Raymond Haux, Colusa.

E. Goerl, Loc. Eng. S. P. R. R.

Ernest Wheeler, Gov. Eng., Manila.

J. Burke, Yosemite R. R.

H. Koenig, Eng. Bay Shore Cut-off.

H. H. Cardwell, Oakland, Cal.

Edwin Miller, Gridley, Cal.

E. Meyer, Bethel, Conn.

B. B. Montgomery, Woodland, Cal.

E. C. Davis, Modesto, Cal.

E. A. Southworth, Honolulu, H. T.

C. K. Fox, Pomona, Cal.

SURVEYORS AND MINING ENGINEERS.

F. W. Stickney, Little River, Mendocino Co., Cal.

Stephen Wakulewicz, Mexico.

S. J. Harris, County Surveyor, Mariposa, Cal.

R. H. Hosking, Eureka Mills, Plumas, Cal.

J. C. McTarnahan, Sonora, Cal.

Richard Harry, Siskiyou Co., Cal.

L. A. Blackburn, Calico, San Bernardino.

Morton L. Tower, Coos Bay.

John C. Booker, U. S. D. M. S., Candelaria.

B. W. Huntoon, Seattle, Wash.

J. A. Graham, County Surveyor, Napa.

William Schuld, Plumas Co.

D. W. Schmotlz, Los Angeles Co.

W. H. Laity, Helena, Mont.

Vic. Woods, County Surveyor, San Luis Obispo.

Will Woodhull, Stockon.

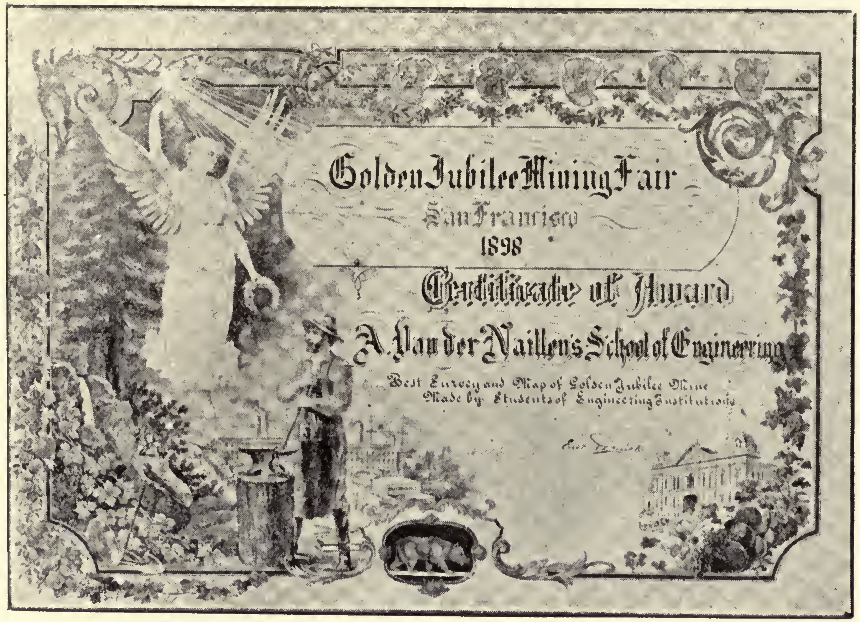
A. L. Finney, County Surveyor, Modesto.

Peter C. Trelour, Mexico.

Josiah Gideon, County Surveyor, Lincoln Co., Oregon.

F. R. Burnham, Pasadena.

Gregor Albertson, Mendocino.



Golden Jubilee Mining Fair
San Francisco
1898

Certificate of Award

A. Van der Naillen's School of Engineering

Best Survey and Map of Golden Jubilee Mine
Made by Students of Engineering Institutions

PHOTO OF A DIPLOMA AWARDED TO OUR STUDENTS AGAINST ALL OTHER COMPETITORS FOR MAKING A PRACTICAL SURVEY AND MAPS OF THE GOLDEN JUBILEE MINE

SURVEYING AND MINING ENGINEERS (Continued)

J. D. Coke, Warner, Idaho.
E. G. Loveridge, Siskiyou, Cal.
John G. Hopper, Co. Surveyor, Sonora, Cal.
J. M. Gleaves, Jr., Chief Clerk Surveyor-General.
J. F. Williamson, Seattle, Wash.
Fred Kellett, St. Helena, Cal.
Paul Lepoids, Los Angeles.
F. Wilson, Supt. Iron Mountain Mines.
J. G. McMillan, County Surveyor, San Jose, Cal.
G. L. Gruss, Genesee, Cal.
John Andrews, Western Mine, Lake Co.
C. Maack, Petaluma.
W. B. Duesler, Globe, Ariz.
E. Matterson, Shasta, Cal.
R. Trengrove, Neuman, Cal.
F. C. James, Johannesburg, South Africa.
F. Gray, San Francisco.
W. S. Keith, Lytton, B. C.
Levi Smith, Silverton, B. C.
E. W. Nolan, Callahans, Cal.
D. G. Barstow, Unga Island, Alaska.
Al. J. Evans, Candelaria Mine, Mexico.
C. P. Christenson, Dunder Mine, Mono County.
C. J. Jourgensen, Tuttletown, Cal.
H. W. H. Penniman, Cal. Exploration Co., San Andreas, Cal.
Baron Carl von Reichach, Antofogasta, Chile.
John D. Casserley, Supt. U. M. C. D. Co., Selukne, Africa.
Ernest McCullough, Consulting Engineer, Chicago.
H. L. Moulder, Cripple Creek.
J. W. Woodford, Supt. N. M. M. Co., Martina, Montana.
Luther Everett, San Francisco.
J. D. Helm, Wickenburg, Arizona.
Alex. Muir, Vancouver, B. C.
I. L. Ryder, Dep. Co. Surveyor, San Jose.
F. W. Saunders, Empire Citv Oregon.
H. H. Cardwell, Roseville, Cal.
F. C. Davis, Forest, Cal.
A. Cowell, Vernalis, Cal.
H. A. Kuns,. Ingomar, Cal.
C. E. Sloan, Searchlight, Nevada.
J. L. Stubbs, Supt. Guadalupe Mine.
A. R. Talamentes, U. S. D. S., Salt Lake.
A. S. Miller, University of Idaho.
S. Willburn Gardner, Colo.
H. J. Hammill, Stockton, Cal.
G. W. Hanson, San Jose, Cal.
J. B. Knight, Shellville, Cal.
E. A. Peugh, Gurneville, Cal.
W. L. Polson, Ketchikan, Alaska.
J. H. Brooks, Coulterville, Cal.
W. H. Davis, Palo Alto, Cal.
C. H. Geiser, Los Angeles, Cal.
C. Huntley, Visalia, Cal.
G. E. Harrison, Susanville, Cal.
H. Keegan, Petaluma, Cal.
L. C. Laughlin, Gurneville, Cal.
L. C. Mavnard, San Jose, Cal.
A. T. Parrott, Etna Mills, Cal.

ELECTRICAL AND MECHANICAL ENGINEERS.

John C. Bell, Walla Wala.
G. H. Ambjoursen, Chief San Rafael plant
Fred Elsey, Oakland, Cal.
K. C. Goodman, London, England.
Frank P. Littlefield, Construction Department, Westinghouse Electric Co.
L. L. Mann, Eleele, Eleele, H. T.
W. F. McBride, Vallejo. Cal.
W. A. Ray, Montana.
Camilo L. Argues, San Jose, Cal.
S. S. Thompson, Canon Electric R. R., Colo.
W. Bulson, Stockton, Cal.
E. J. Hamilton, Healdsburg, Cal.
L. A. White, Amador City, Cal.
F. F. Dreschler, Port Costa, Cal.
L. E. McKav Stockton, Cal.
G. H. Stockbridge, Los Angeles, Cal.
C. Langerman, Alaska.
Thomas Oriel, Mexico.
B. Willer, Grass Valley, Cal.
E. M. Reynolds, Lathrop, Cal.
C. Krasilnikoff, Vladivostock, Siberia.
E. H. Lowe, Chief Electrician, U. S. S. Charleston.
L. Prior, Suisun Electrical Plant.
E. J. Bowen, Wire Works, San Francisco.
J. F. Endert, Crescent City.
A. R. Powers, Virginia City.
Percy Levi, Underwriters, S. F.
R. F. Rasmussen, Ferndale, Cal.
Harry Pickett, S. P. R. R.
R. Colley, Oakland, Cal.
H. Dunning, Hamilton, Cal.
O. Rufert, Fresno, Cal.
B. Tully, Fruitvale, Cal.
J. W. Davison, Villa Grove, Colo.
W. Newby, Niles, Cal.
A. D. Peers, Gilroy, Cal.
T. C. Will, Oakland, Cal.

METALLURGICAL AND ASSAYING.

A. C. Carlock, Redding, Cal.
S. Archer, Goldfield, Nev.
J. C. Aconite, Rossland, B. C.
T. H. Holland, Aux Vasse, Mo.
J. P. Langhorne, Jr., San Francisco.
A. Thomalen, Guaymas, Mexico.
H. J. Murdock, Idaho.
Oscar Roundtree, Mexico.
Wm. F. Johns, Johnsville, Plumas, Co.
Jos. A. Robles, Mexico.

METELLURGICAL AND ASSAYING Continued)

Everett F. Russell, Oakland, Cal.
Jacob Corbin, Calico.
Fred H. Deakin, San Francisco, Cal.
Geo. V. Gray, Gladstone Mine, Shasta Co.
Geo. Mudd, South Africa.
Alfred Price, San Rafael, Cal.
James E. Rodgers, San Francisco, Cal.
JOSE REYNA BARIOS, President of the Republic of Guatemala.
Thomas Hanmore, Alaska Com'l Co.
R. Remick, Taylorville, Cal.
M. D. Allen, Globe, Ariz.
A. C. Hall, San Jose, Cal.
A. L. Kievicy, Amador, Cal.
L. E. Bailey, San Jose, Cal.
J. Mackin, Buffalo, Ariz.
D. A. Connolly, Iron Mt. Mines, Keswick.
C. E. Allen, Eureka, Nev.
J. H. Hennessey, Randsburg.
Herman Flender, Norwegian Mine.
J. W. Walker, Grant, Oregon.
McM. Jones, Paris, Ill.
A. M. Thomas, Sutter Creek.
G. A. Wrightson, Bully Hill Mine.
J. N. McLeish, Nome, Alaska.
C. J. Perry, Ithaca, New York.
C. A. Ross, Vancouver, B. C.
W. W. Rush, Ketchikan, Alaska.
C. Williamson, French Gulch, Cal.
D. E. Williams, Chinese Camp, Cal.
H. Kjelsberg, Fruitvale, Cal.
D. Maddox, Greenwater, Cal.
H. R. Palmer, Long Beach, Cal.
H. W. Palmer, Berkeley, Cal.
W. J. Newell, Nevada City.
J. W. Zimmerman, Susanville.
R. J. Dunphy, Berkeley, Cal.
K. L. Hughes, Madera, Cal.
E. J. Jones, Sumpter, Ore.
H. E. Williams, Saguachi, Colo.
W. H. Brethour, Sidney, B. C.
E. H. Page, San Francisco, Cal.
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Eugene Dinmer, Garrett's Brass Works, San Francisco.
George Fee, Honolulu.
F. W. Gale, San Francisco.
O. E. Oliver, Alameda.
Fred Schadler, Reno, Nev.
Milton Bulkley, San Francisco.
Mario Capuccio, Union Iron Works.
Geo. B. Von Boden, Sac. Car Shops.
J. H. Aquilar, Salvador.
L. B. Thomas, San Francisco.
Fred Stein, Seattle.
A. Nelson, San Francisco.
W. Anderson, San Mateo.
DANIEL ASHWORTH, Consulting Engineer, Carnegie Bros., Pittsburg.
Frank D. Reyes, Guatemala.
B. Thompson, Oakland.
F. G. Carr, Oakland.
E. Jose, San Francisco.
R. A. Beuttler, San Francisco.
A. B. Charlton, Berkeley, Cal.
G. Mellmann, Oakland.
R. Cummings, Napa, Cal.
E. J. Moncrief, Rodeo, Cal.

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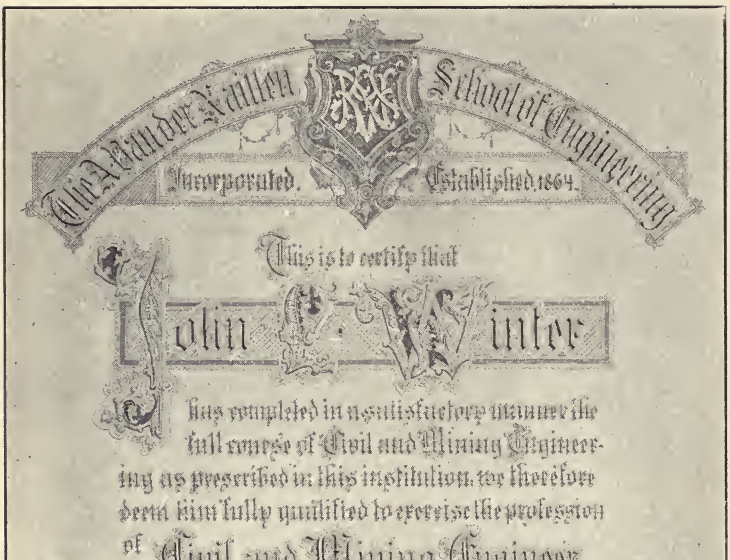
Successfully Passed Government Examination.

Thos. F. Cosgriff, Germiston, Transvaal, South Africa.
Clark C. Bradford, Examiner Building, San Francisco.
William Mullen, Chronicle Building, San Francisco.
C. E. Barney, San Francisco.
W. G. Rowley, San Francisco.
E. Steen, San Francisco.
J. Regan, San Francisco.
R. J. Efford, San Francisco.
W. Crompton, San Francisco.
C. Irvine, San Francisco.
O. W. Thom, San Francisco.
M. Johnson, San Francisco.
P. Donelon, Sacramento.
A. Hansen, San Francisco.
R. E. McDaniel, Creswell, Oregon.
Ray H. Craig, San Francisco.
S. Crisp, San Francisco.
F. J. Walsh, San Francisco.
R. Christensen, San Francisco.
M. D. Sullivan, San Francisco.
R. H. Moore, Alameda.
J. P. Nissen, Oakland.



The A. Van der Naillen School of Engineering

Incorporated. Established 1864.

This is to certify that

John C. Winter

has completed in a satisfactory manner the full course of Civil and Mining Engineering as prescribed in this institution, we therefore deem him fully qualified to exercise the profession of

Civil and Mining Engineer.

In Testimony Whereof, we have this day signed these presents and affixed our seal hereto. San Francisco, January 25, 1898.

A. Van der Naillen

A. Van der Naillen Jr.
MANAGER

SPECIMEN OF DIPLOMA AWARDED BY OUR INSTITUTION

CONDITIONS OF ADMISSION.

The pupil is admitted upon the presumption that he is a gentleman, and he will be treated as such by all connected with the school. But if he contradicts this presumption by the non-observance of his duties or any of the regulations, or by his conduct in any manner, he will be subjected, at any time, to expulsion from the school.

THE STUDENT'S DUTIES.

1. To be present promptly, day pupils at 9 o'clock a.m., and at 1:30 p.m. Evening pupils at 7 o'clock p.m.
2. To be regular and punctual in attendance.
3. The school-room will be closed between 12 and 1 o'clock.
4. Students wishing to leave before the close of school hours must obtain permission from the professor.
5. To enter and leave the building and school-rooms in a quiet and orderly manner.
6. To immediately, on entering the room, proceed quietly and promptly to his seat, and pursue his work.
7. Writing on or defacing the walls of school-rooms, adjoining rooms or closets, will be a cause for IMMEDIATE EXPULSION from school.
8. To keep in good order the desk, seat and drawer appropriated to his use, and to put all waste paper in the basket provided for that purpose.
9. To hold no communication or talk with any student at any time or in any place in the school-rooms, without first obtaining permission from his Instructor.
10. Not to leave his seat without first obtaining permission, except to go to the Instructor's desk for instructions.
11. To abstain from smoking, or from the use of tobacco in any form, while in or about the school building. **This rule will be strictly enforced.**
12. To refrain from being noisy or stopping at the hall adjoining the entrance to the school-rooms, or in vestibule or on the sidewalk before the building.
13. To notify the Secretary in advance, for all intended absence from school, and if for a period longer than two weeks drawer in desk must be surrendered, or else said tuition time will not be deducted.
14. To engage only in his regular studies, except by special permission, and do nothing to interfere with a fellow-student in any shape, or in any manner idle away his own time.
15. To call only on his Instructor for instruction, and not to copy, or borrow for examination, the work or exercises of any other pupil.
16. To show in every action and movement that he is determined to acquire every necessary qualification for a first-class, honest and industrious engineer.
17. Students in the different departments are responsible for breakage.
18. Students studying Surveying, Mining, and Civil Engineering, should go in the field for practice at least twice a week.
19. Students bringing luncheon and wishing to eat same in school-room must be through by 12 m.
20. All students must occupy at least half of the day in drawing unless otherwise agreed upon.
21. All drawings must be approved by one of the instructors before taken off the board.
22. At home on Saturdays, when not having done so on week evenings, the student is expected to transfer his week's studies to his record-book and to keep the same in the neatest and most complete manner. First Monday of every month the students must bring their record-books to the school, and leave the same on the Principal's desk for verification and inspection.
23. The field instruments must be brought back to the school every day by 4 o'clock, and under no circumstances must they remain out over night.
24. Students are responsible for the use of the instruments. Pins, plumb-bobs, reading glass, and hatchet must be furnished by each student.
25. Students will not be allowed to work or study in the school-room on Saturdays, as they are expected to post up their record-book at home.
26. Absence of less than one week will not be deducted.
27. Money paid for tuition is never refunded.
28. In no case will tuition be transferable.
29. Students must follow their respective REGULAR courses unless otherwise agreed upon. A regular course can be transmuted at any time to a special course at the rate of $30 per month.
30. Any student who will tamper with any of the electrical wires, apparatus, or machinery will be subject to immediate expulsion.
31. All students must first obtain permission before using tools, machinery, or instruments of any kind.
32. Students in engineering departments taking Assaying must pay in advance for materials. Course I—$7.50. Course II—$10.00.

Any infringement of the above rules will cause the student to be suspended from the school for a long or short period, according to the gravity of the offense, and a second infringement will cause irrevocably the dishonorable expulsion of the student.

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